TAXONOMIC STUDIES ON SOME CHALCIDOID PARASITES (HYMENOPTERA) OF INSECTS

ABSTRACT

THESIS PRESENTED FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

IN

ZOOLOGY

OF

THE ALIGARH MUSLIM UNIVERSITY, ALIGARH

BY

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DEPARTMENT OF ZOOLOGY
ALIGARH MUSLIM UNIVERSITY
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ABSTRACT

The present work incorporates taxonomic studies on some Chalcidoid parasites belonging to the families, Eulophidae, Aphelinidae and Trichogrammatidae. It is based on specimens reared from their hosts mostly belonging to Homopterous families, collected from various localities of India during 1974-1977.

In general introduction portion important works on the families Eulophidae, Aphelinidae and Trichogrammatidae are cited, a short resumé on supra-generic classification of each of the three families is given, taxonomic significance of the characters of pronotum, subgenital plate, external female and male genitalia is discussed, insect hosts are listed and allocated to their respective families. List of parasites included in the present work is also given.

The entire work is divided into three parts. Part I deals with the family Eulophidae, Part II deals with the family Aphelinidae and Part III deals with the family Trichogrammatidae.

PART I. FAMILY EULOPHIDAE.- In introduction, review of literature of the family Eulophidae is given. Peck et al. (1964) system of classification is adopted in dividing the family Eulophidae into five subfamilies: Elachertinae, Eulophinae, Entedontinae, Tetrastichinae and Euderinae. Key

to subfamilies of Eulophidae, and keys to some genera of the subfamilies, Tetrastichinae, Elachertinae, Euderinae and Entedontinae are provided. Thirty-two species representing nine genera viz., Tetrastichus Haliday, Syntomosphyrum Foerster, Scotolinx Ashmead, Euplectrus Westwood, Allocerastichus Masi, Euderastichus Boucek, Chrysonotomyia Ashmead, Neochrysocharis Kurdjumov and Pediobius Walker are described in detail with illustrations. Twenty-eight species are described as new. Two genera viz., Allocerastichus Masi and Euderastichus Boucek and one species viz., Pediobius obtusiceps Boucek are reported for the first time from India.

PART II. FAMILY APHELINIDAE.- In introduction, review of literature of the family Aphelinidae is given. Shafee and Khan's (1978) system of classifying the family Aphelinidae into subfamilies and tribes is adopted. Revised key to subfamilies of Aphelinidae, and keys to tribes and genera of the subfamilies, Aphelininae and Coccophaginae are provided. Thirty-three species representing fourteen genera viz., Eretmocerus Haldeman, Aphelinus Dalman, Centrodora Foerster, Syediella Shafee, Aphytis Howard, Marietta Motschulsky, Eriaphytis Hayat, Coccophagus Westwood, Aneristus Howard, Physcus Howard, Ablerus Howard, Azotus Howard, Prospaltella Ashmead and Trichaporus Foerster are included with illustrations. New species are described in detail and additional specific characters are proposed for some of the known species. The genus Prospaltella Ashmead is

divided into two subgenera, Prospaltella Ashmead and Neoprospaltella subg. n., based on exserted and unexserted condition of ovipositor and shape of last abdominal tergum. One subgenus and five species are described as new, and one species viz., Eretmocerus paulistis Hempel is reported for the first time from India.

PART III. FAMILY TRICHOGRAMMATIDAE.- In introduction, review of literature of the family Trichogrammatidae is given. Doutt and Viggiani's (1968) system of classification is adopted. Key to Indian genera of the family Trichogrammatidae is provided. Additional specific characters are proposed and illustrations are given for the recently described species, Brachygrammatella aligarhensis Khan, Brachygrammatella longiclavata Khan, Mirufens brevifuniculata Khan & Shafee, Mirufens albiscutellum Khan & Shafee, Mirufens mangniclavata Khan & Shafee and Mirufens longiclavata Khan & Shafee. Keys to species of the genera Brachygrammatella Girault and Mirufens Girault are revised in order to incorporate the additional specific characters and also to accommodate some Indian species. A separate key to some Indian species of Mirufens Girault, based on males is also provided.

The stability of the generic characters viz., Pronotum, subgenital plate and external female genitalia proposed by earlier workers in some of the Aphelinid genera are confirmed. Further, these characters are used in the generic diagnosis of

the families Eulophidae, Aphelinidae and Trichogrammatidae. In keys to genera of the families Eulophidae, Aphelinidae and Trichogrammatidae based on females, besides, employing the generic characters proposed by earlier workers, the new generic characters of pronotum, subgenital plate and external female genitalia are also incorporated in the genera studied.

Taxonomic significance of male genitalia is shown and to a great extent this character is used in segregating the species of the genera studied in the families Eulophidae, Aphelinidae and Trichogrammatidae.

The number of setae along posterior margin of pronotum, shape of first and second valvifers, length of third valvulae are good specific characters, and are incorporated in keys to the species of the genera studied. The new species are accommodated either by revising published keys or by proposing new keys. However, in most cases keys to Indian species are proposed. Host and distribution data are given for all the species.

The present work is supported by 622 figures arranged in 44 plates. The plates containing figures are inserted at appropriate places within the text. References given at the end are those which cited in the text.

Holotypes, paratypes and other material examined by the present writer are deposited in Zoological Museum, Aligarh Muslim University, Aligarh, India.

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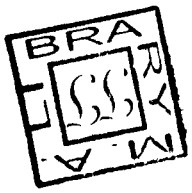

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DEPARTMENT OF ZOOLOGY
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Date 21.12.1978

This is to certify that Mr. Mohammad Younus Khan has completed his Ph.D. work under my supervision on a problem entitled "Taxonomic studies on some Chalcidoid parasites (Hymenoptera) of insects". This is an original contribution containing descriptions of new and redescriptions of known species, and observations on some characters of taxonomic significance. This work is an addition to the existing knowledge of insect taxonomy. He is allowed to submit his thesis for the award of Ph.D. Degree in Zoology of the Aligarh Muslim University, Aligarh, India.

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C O N T E N T S

PART II

I. ACKNOWLEDGMENTS

The present writer is greatly indebted to Dr. S. Adam Shafee, Department of Zoology, Aligarh Muslim University, Aligarh, for his most valuable guidance and supervision and for taking great pains in critically going through the manuscript. He is also thankful to Prof. S. Mashhood Alam, Head, Department of Zoology, Aligarh Muslim University, Aligarh, for valuable suggestions and for providing necessary facilities, and to Prof. Nawab Hasan Khan of the same Department for encouragement. Thanks are also due to Dr. Man Mohan Agarwal, Department of Zoology, Aligarh Muslim University, Aligarh, for many useful suggestions, Dr. Mohammad Ali, Superintending Zoologist, Zoological Survey of India, Calcutta, for identifying the coccid hosts, and to the University Grants Commission, New Delhi, for financial assistance during the tenure of this work. Lastly, he wishes to thank his colleagues, Mr. Mohammad Nayyar Azim, Mr. Rajendra Kumar Avasthi and Mr. Mohammad Kamil Usmani, for assistance.

II. GENERAL INTRODUCTION

The thesis incorporates taxonomic studies on some chalcidoid parasites belonging to the families, Eulophidae, Aphelinidae and Trichogrammatidae. The members of these families are parasites or hyperparasites of various insect pests attacking chiefly the eggs or larval stages of the host. They constitute an economically important group of natural enemies. Many of these species are great benefit to man in reducing the population of the pest species.

Considerable amount of taxonomic work on this group of parasites has been done outside India. Among them are: Foerster (1856, 1878), Thomson (1876, 1878), Howard (1881, 1894b, 1895a), Ashmead (1894, 1904a), Schmiedeknecht (1909), Mercet (1912, 1930), Girault (1912, 1913 a,b, 1915), Gahan and Fagan (1923), Ferrière (1928, 1930, 1931 a,b, 1933, 1941, 1965), Compere (1931, 1936, 1955), Burks (1943, 1966), De Santis (1948), Muesebeck *et al.* (1951), Risbec (1951, 1952), Nikol'skaya (1952), Alam (1956), Bouček (1958, 1959 a,b, 1977 a,b), Erdös (1953, 1956, 1964, 1966), Graham (1959, 1961, 1971), Kerrich (1960, 1969, 1973, 1974), Askew (1962, 1968), Peck (1963), Peck *et al.*(1964), Hedqvist (1963), Domenichini (1965), Nikol'skaya & Yasnosh (1966), Doutt & Viggiani (1968), Annecke & Insley (1970), Yasnosh (1976), and Kostyukov (1976, 1977).

In India no comprehensive work has been done especially on the families, Eulophidae, Aphelinidae and Trichogrammatidae. Some contributions on this group of parasites were made by Cameron (1913), Rohwer (1921), Waterston (1922 a), Mani (1938, 1939, 1942), Ferrière (1940 a), Kurian (1952, 1953 a, 1954), Agarwal (1964 a,b), Subba Rao (1969 a,b), Shafee (1970, 1972 a, 1973a, 1974), Shafee and Khan (1978), Hayat (1971 a,b, 1972 a,b, 1973, 1974 a,b,c), Nagaraja (1973), Nagaraja and Nagarkati (1969), Viggiani & Hayat (1974), Saraswat (1975, 1978) and Khan & Shafee (1976, 1977).

The present writer, in consonance with the views of the recent workers, has accepted the family status of Eulophidae, Aphelinidae and Trichogrammatidae. A short résumé on suprageneric classification of each of the three families is given below:

Family Eulophidae*.- Westwood (1840) put Eulophids under the subfamily Eulophides of the family Chalcididae. Foerster (1856) attributed the Eulophid genera under his newly proposed families: Elachistoidae, Eulophoidae, Entedonoidae and Tetrastichoidae. Later, Thomson (1878) demoted the families as recognized by Foerster to the rank of tribes: Elachistina, Eulophina, Entedonina and Tetrastichina. Ashmead (1904 a)

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* For details refer pages 19-27.

accepted the family status of Eulophidae and recognized five subfamilies: Elachertinae (with tribes Euplectrini, Ophelinini and Elachertini), Eulophinae (with tribes Eulophini and Hemiptarsenini), Entedoninae (with tribes Tetracampini, Entedonini, Omphalini and Pediobini), Tetrastichinae (with tribes Tetrastichini and Ceratoneurini), and Aphelininae (with tribes Aphelinini and Pteroptricini). The last subfamily was later raised to the rank of family Aphelinidae by Viereck (1916). Girault (1915) and Mani (1938) adopted Ashmead's (1904 a) system of classifying the Eulophids into subfamilies and tribes. Nikol'skaya (1952) followed Foerster (1856) in giving family status to Elachertidae (= Elachistoidae Foerster), Eulophidae, Entedontidae and Tetrastichidae. Erdös (1956) recognized Elachertinae, Eulophinae, Entedontinae and Tetrastichinae as subfamilies of Eulophidae. He proposed a new tribe Euderini under the subfamily Entedontinae. Later, the tribe Euderini was raised to the rank of subfamily Euderinae by Graham (1959). Peck et al. (1964) recognized five subfamilies: Elachertinae, Eulophinae, Entedontinae, Tetrastichinae and Euderinae under the family Eulophidae. The present writer followed Peck et al. (1964) in dividing the family Eulophidae into five subfamilies.

Family Aphelinidae*.- Thomson (1876) proposed the tribe Aphelinina. Later, the tribe Aphelinina was raised to the rank

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* For details refer pages 171-178.

of subfamily Aphelininae by Howard (1881). Ashmead (1904 a) recognized Aphelininae as subfamily of Eulophidae and divided it into two tribes: Aphelinini and Pteroptricini. This system was followed by Howard (1907) and Mani (1938). Viereck (1916) raised the subfamily Aphelininae to the rank of family Aphelinidae. Mercet (1930) divided the family Aphelinidae into Aphelininae, Pteroptricinae and also added a third subfamily Calesinae to it. De Santis (1946) divided the family Aphelinidae into three subfamilies: Aphelininae, Coccophaginae and Calesinae. Nikol'skaya (1952) and Peck et al. (1964) discarded the system of classifying Aphelinids into subfamilies and tribes adopted by earlier workers. Ghesquière (1955) proposed Eriaporinae under Aphelinidae. Ferrière (1965) split the family Aphelinidae into four subfamilies: Aphelininae, Coccophaginae, Pteroptricinae and Eriaporinae. Nikol'skaya and Yasnosh (1966) recognized five subfamilies: Aphelininae, Coccophaginae, Calesinae, Azotinae and Prospaltellinae in Aphelinidae, the last two were proposed as new subfamilies. Further, they dropped the subfamily Eriaporinae from Aphelinidae. Yasnosh (1976) raised the total to seven by proposing two new subfamilies: Aphytinae and Physcinae under Aphelinidae. Further, he divided the subfamily Aphytinae into two tribes: Aphytini and Centrodorini. Very recently, Shafee & Khan (1978) recognized Aphelininae (with tribes Aphelinini and Mariettini),

Coccophaginae (with tribes Coccophagini and Prospaltellini), Pteroptricinae and their newly proposed subfamily Eretmocerinae under the family Aphelinidae. The present writer adopted Shafee & Khan's (1978) system of classifying the Aphelinids into subfamilies and tribes.

Family Trichogrammatidae*.- Westwood (1840) put Trichogrammatids under the subfamily Encyrtides of the family Chalcididae. Walker (1851) proposed the tribe Trichogrammini. Later, the tribe Trichogrammini was raised to the rank of family Trichogrammatoidae by Foerster (1856). Walker (1872) used the family name as Trichogrammidae. Thomson (1876) demoted the family Trichogrammidae to the rank of tribe Trichogrammina. Ashmead (1904 a) accepted the family status of Trichogrammidae and divided it into two subfamilies: Trichogramminae and Oligositinae. Girault (1912) used the family name as Trichogrammatidae and divided it into two subfamilies: Trichogrammatinae (with tribes Trichogrammatini and Poropaeini), and Chaetostrichinae (with tribes Chaetostrichini and Lathromerini). Nikol'skaya (1952) and Doutt & Viggiani (1968) discarded Ashmead's (1904 a) and Girault's (1912) systems of classifying the Trichogrammatids into subfamilies and tribes respectively. Peck et al. (1964) divided the family Trichogrammatidae into two subfamilies: Trichogrammatinae and

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* For details refer pages 276-279.

Lathromerinae. The present writer adopted Nikol'skaya's (1952) and Doutt & Viggiani's (1968) system of classification.

The system of classifying chalcids by earlier workers were mainly based on easily recognizable externally visible characters. Alam (1956, 1957) for the first time emphasized the generic importance of the characters of pronotum, subgenital plate and external female genitalia in some of the British genera of the families Aphelinidae and Encyrtidae. These characters were emphasized by subsequent workers in other genera of the families, Aphelinidae (Agarwal, 1964 b; Nikol'skaya and Yasnosh, 1966; Hayat, 1971 b; 1972b; Shafee, 1972 a), Encyrtidae (Tryapitsyn, 1968; Shafee et al. 1973), Eupelmidae (Shafee, 1973b), Signiphoridae (Hayat, 1970), Eurychidae (Shafee, 1975) and Chalcididae (Farooqi, 1976). Yasnosh (1976) in the Aphelinidae raised the status of pronotal character i.e. divided and undivided condition of pronotum, to subfamily level; whereas, Shafee & Khan (1978) considered this character as a stable tribal character for Aphelinini, Mariettini, Coccophagini and Prospaltellini.

The present writer confirmed the stability of the generic characters viz., pronotum, subgenital plate and the external female genitalia proposed by earlier workers in the Aphelinid genera studied by them. Further, he used the

characters of pronotum, subgenital plate and external female genitalia as discovered by Alam (1956, 1957) in the generic diagnosis of Eulophidae, Aphelinidae and Trichogrammatidae.

Taxonomic significance of male genitalia has been shown by many workers in the families: Aphelinidae (Annecke, 1965; Nikol'skaya & Yasnosh, 1966; Yasnosh, 1976; Zinna, 1961, 1962), Eulophidae (Waterston, 1915 b; Risbec, 1951; Miller, 1962, 1964 a,b, 1965c), Trichogrammatidae (Nagarkati & Nagaraja, 1971; Viggiani & Hayat, 1974), Tetracampidae (Sugonjaev, 1971), Encyrtidae (Miller, 1958, 1961, 1965 b; Tryapitsyn, 1968; Viggiani, 1967), Cleonymidae (Miller, 1965 a), Pteromalidae (Hedqvist, 1963), Chalcididae (Farooqi, 1976). The present writer to a great extent used this character in the generic diagnosis of some genera, as well as for segregating the species of the families, Eulophidae, Aphelinidae and Trichogrammatidae.

Subfamilial and generic keys of the family Eulophidae, subfamilial, tribal and generic keys of the family Aphelinidae and generic key of the family Trichogrammatidae are provided. In his keys to genera of the families Eulophidae, Aphelinidae and Trichogrammatidae, he not only employed the generic characters proposed by earlier workers but also incorporated the additional generic characters of pronotum, subgenital plate and external female genitalia as studied by him in most of the genera.

The number of setae along posterior margin of pronotum, shape of first and second valvifers, length of third valvulae are good specific characters. These characters are incorporated in keys to the species of the genera studied by him. The new species are accommodated either by revising published keys or by proposing new keys to species. In most cases key to Indian species are proposed. The new and inadequately described species are fully described, already known species are mentioned and some additional specific characters are proposed for them.

The present study is based on the specimens bred from their hosts, collected from various localities. This has revealed useful information on host-parasite relationship. The following hosts were examined:

Coccidae:..... Coccus viridis (Green), Coccus hesperidum Limnaeus, Coccus sp., Pulvinaria maxima Green, Pulvinaria sp. and Ceroplastodes sp.

Pseudococcidae: ..... Rastrococcus icervoides (Green), Ferrisia virgata (Cockerell), Nipaecoccus vastator (Maskell) and Coccidohystrix insolitus (Green), Mealy bugs.

Diaspididae: ..... Aonidiella orientalis (Newstead).

Asterolecanidae: ..... Cerococcus hibisci Green.

Lecanodiaspididae: ..... Anomalococcus cremastogastri Green.

Lacciferidae: .....Kerria lacca (Kerr).

Aphididae: .....Aphid.
Psyllidae: .....Psyllids
Aleyrodidae: .....Aleurolobus barodensis Maskell,
Neomaskellia bergii Signoret and
Aleyrodes sp.

Membracidae: .....Oxyrachis tarandus Fabricius:

Fulgoridae: .....Pyrilla perpusilla Walker, Fulgorid eggs.

Coccinellidae: .....Coccinellid larvae

Lepidopterous larvae and Dipterous pupae.

The thesis contains 622 figures arranged in 44 plates. The plates containing figures have been inserted in the text at appropriate places. For the sake of convenience and also to restrict the pages to the required number the legends are typed on the back of the pages.

References marked with an asterisk (*) have not been consulted in original because of their non-availability. Any way, efforts have been made to make-up this short-coming by consulting very standared and recent works on this group. However, these references are included to present a more complete list of references.

The present work contains the study of nine genera (Tetrastichus Haliday, Syntomosphyrum Foerster, Scotolinx Ashmead, Euplectrus Westwood, Allocerastichus Masi, Euderastichus Bouček,

Chrysonotomyia Ashmead, Neochrysocharis Kurdjumov and Pediobius Walker) and thirty-two species of Eulophidae; fourteen genera (Eretmocerus Haldeman, Aphelinus Dalman, Centrodora Foerster, Syediella Shafee, Aphytis Howard, Marietta Motschulsky, Eriaphytis Hayat, Coccophagus Westwood, Aneristus Howard, Physcus Howard, Ablerus Howard, Azotus Howard, Prospaltella Ashmead and Trichaporus Foerster), two subgenera (Prospaltella Ashmead and Neoprospaltella subg. n.) and thirty-three species of Aphelinidae, and two genera (Brachygrammatella Girault and Mirufens Girault) and six species of Trichogrammatidae. Twenty-eight species of Eulophidae, one subgenus and five species of Aphelinidae are new to science. Two genera and one species of Eulophidae, one species of Aphelinidae are recorded for the first time from India. One species of Aphelinidae and six species of Trichogrammatidae were recently described as new species. (Khan, 1975 a,b; Khan & Shafee, 1976, 1977).

Holotypes, paratypes and other material examined by the present writer are deposited in Zoological Museum, Aligarh Muslim University, Aligarh, India.

LIST OF PARASITES AND THEIR HOST INSECTS

PARASITE	HOST
Family Eulophidae.	
1. *Tetrastichus indicus* sp. n.	Mealy bug
2. *Tetrastichus aligarhensis* sp. n.	Coccinellid larvae
3. *Tetrastichus burksi* sp. n.	*Cerococcus hibisci* Green
4. *Tetrastichus purpureus* (Cameron)	*Kerria lacca* (Kerr)
5. *Tetrastichus ferrierei* sp. n.	*Pulvinaria maxima* Green
6. *Tetrastichus manmohani* sp. n.	*Coccidohystrix insolitus* (Green)
7. *Tetrastichus nainitalensis* sp. n.	*Kerria lacca* (Kerr)
8. *Tetrastichus nigricornis* sp. n.	*Nipaecoccus vastator* (Maskell)
9. *Tetrastichus nigricorpus* sp. n.	*Nipaecoccus vastator* (Maskell)
10. *Tetrastichus metallicus* sp. n.	*Pulvinaria* sp.
11. *Tetrastichus ajmerensis* sp. n.	*Coccidohystrix insolitus* (Green)
12. *Tetrastichus annulicornis* sp. n.	*Coccidohystrix insolitus* (Green)
13. *Tetrastichus flavus* sp. n.	Psyllids
14. *Tetrastichus flavidus* sp. n.	Coccid

PARASITE	HOST
15. Tetrastichus longicorpus sp. n.	Cerococcus hibisci Green
16. Tetrastichus maculatus sp. n.	Ferrisia virgata (Cockerell)
17. Tetrastichus magnicorpus sp. n.	Ferrisia virgata (Cockerell)
18. Syntomosphyrum cerococci sp. n.	Cerococcus hibisci Green
19. Syntomosphyrum mashhoodi sp. n.	Coccinellid larvae
20. Syntomosphyrum udaipurensis sp. n.	Pyrilla sp. eggs
	Fulgorid eggs
21. Syntomosphyrum anomalococci sp.n.	Anomalococcus crematogast ri Green
22. Scotolinx quadristriata Subba Rao & Ramamani	Lepidopterous larvae
23. Euplectrus gopimohani Mani	Lepidopterous larvae
24. Allocerastichus longicorpus sp. n.	Dipterous pupae
25. Euderastichus nigricorpus sp. n.	Dipterous pupae
26. Chrysonotomyia kerrichi sp. n.	Psyllid
27. Chrysonotomyia latipennis sp. n.	Leaf galls
28. Neochrysocharis hyalipennis sp. n.	Coccus sp.
29. Neochrysocharis metallicus sp. n.	Coccus sp.

PARASITE	HOST
30. Neochrysocharis pubipennis sp. n.	Pulvinaria sp.
31. Pediobius obtusiceps Boucek	Spider eggs
32. Pediobius longicorpus sp. n.	Dipterous pupae

Family Aphelinidae.

1. Eretmocerus aligarhensis sp. n.	Aleyrodes sp.
2. Eretmocerus longipilus sp. n.	Aleyrodes sp.
3. Eretmocerus mashhoodi Hayat	Neomaskellia bergii Signoret
4. Eretmocerus paulistis Hempel	Neomaskellia bergii Signoret
5. Aphelinus mali (Haldeman)	Aphid
6. Aphelinus desantisi Hayat	Aphid
7. Aphelinus flavipes (Foerster)	Aphid
8. Svediella maculata Shafee	Mealy bug
9. Aphytis alami Agarwal	Coccid
10. Centrodora azizi Hayat	Oxyrachis tarandus Fabr. eggs
11. Centrodora mumtazi Hayat	Oxyrachis tarandus Fabr. eggs
12. Marietta javensis (Howard)	Cerococcus hibisci Green

PARASITE	HOST
13. Eriaphytis orientalis Hayat	Cerococcus hibisci Green
14. Coccophagus bivittatus Compere	Cerococcus hibisci Green
15. Coccophagus longiclavatus Shafee	Kerria lacca (Kerr)
16. Coccophagus longipedicellus Shafee	Coccus sp.
17. Coccophagus bogoriensis (Koningsberger)	Coccus viridis (Green)
18. Coccophagus cowperi Girault	Nipaecoccus vastator (Maskell)
	Coccid
19. Coccophagus tschirchii Mahdihassan	Coccus hesperidum Linn.
20. Coccophagus mysorensis sp. n.	Ceroplastodes sp.
21. Coccophagus manii Agarwal	Cerococcus bibisci Green
22. Coccophagus nigricorpus Shafee	Pulvinaria sp.
23. Coccophagus silvestrii Compere	Coccid
	Rastrococcus icervoides (Green)
24. Coccophagus shafeei Hayat	Coccus sp.
25. Ameristus ceroplastae Howard	Coccid
26. Physcus reticulatus Compere & Annecke	Coccidohystix insolitus (Green)
27. Ablerus aonidiellae Hayat	Aonidiella orientalis (Newst)

PARASITE	HOST
28. Azotus bimaculatus Khan & Shafee	Aleurolobus barodensis Maskell
29. Prospaltella breviclavata Shafee	Neomaskellia bergii Signoret
30. Prospaltella terebrator Shafee	Neomaskellia bergii Signoret
31. Trichaporus nigrocoxalis sp. n.	Aleyrodes sp.
32. Trichaporus longicornis sp. n.	Aleyrodes sp.
33. Trichaporus partenopeus (Masi)	Aleyrodes sp.

Family Trichogrammatidae.

1. Brachygrammatella aligarhensis Khan	Oxyrachis tarandus Fabr. eggs
2. Brachygrammatella longiclavata Khan	Oxyrachis tarandus Fabr. eggs
3. Mirufens brevifuniculata Khan & Shafee	Oxyrachis tarandus Fabr. eggs
4. Mirufens albiscutellum Khan & Shafee	Oxyrachis tarandus Fabr. eggs
5. Mirufens magniclavata Khan & Shafee	Oxyrachis tarandus Fabr. eggs
6. Mirufens longiclavata Khan & Shafee	Oxyrachis tarandus Fabr. eggs

III. MATERIAL AND TECHNIQUES

Collecting, Rearing and Preservation:

Collections were made by visiting various important agricultural areas of India during 1974-1977. Mostly parasitized eggs and different stages of host insects were collected *in situ* by detaching pieces of bark, twigs, or other plant parts. At the same time few unparasitized host specimens were removed individually from the same plant and preserved in 70% alcohol to facilitate their correct identification. A complete record was maintained indicating the reference number, locality, date of collection, name of host plant and host insect.

The selected pieces of bark, twigs or other plant parts were cut into small pieces and put in rearing jars (4" x 2"), the mouth being closed with white paper held with a rubber band. A slip was fixed to each jar indicating the reference number. The parasites were reared under room temperature. The jars were checked daily for the emerged parasites.

The emerged parasites were removed from rearing jar and preserved in 70% alcohol in glass vials. The preserved specimens were then separated upto specific level under stereoscopic binocular. Data regarding the number of specimens of females and males of each species from each sample was also recorded.

Mounting, Measurements and Illustrations:

Permanent slides were prepared to enable detail study of

important structures of the parasite. The normal process of dehydration was adopted and clearing was done in clove oil. The specimens were dissected in clove oil medium under the dissecting binocular microscope with the help of fine needles. The dissected parts viz., mouth parts, antennae, pronotum, wings, subgenital plate and external genitalia were placed on a micro-slide in a drop of Canada balsam while the remaining parts on another slide and were oriented into the required position. The dissected parts were later mounted in Canada balsam under a 22-mm square cover glass. The slides were kept in a thermostat at a temperature of approximately 40°C for about one week to make it completely dry. The permanent slides were examined under the microscope in order to make a detail study of each component of the body. This approach has revealed some characters which otherwise are likely to be missed in tag dry specimens.

Card mounts were also made for better understanding of certain characters like colour, sculpture etc. of the parasites.

Measurements of whole specimens as well as different parts were taken with the help of an Ocular micrometer and Slide micrometer. Drawings of important structures were made with the help of Camera lucida.

PART I

IV. FAMILY: EULOPHIDAE WESTWOOD

INTRODUCTION

The family Eulophidae is based on Olivier's genus Eulophus described in 1791. Westwood (1840) in his work entitled "An introduction to the moderen classification of insects" made the first significant effort on the taxonomy of the subfamily Eulophides. He attributed 13 genera to it: Stenomesius Westwood, Euplectrus Westwood, Hemiptarsenus Westwood, Dicladocerus Westwood, Elasmus Westwood, Eulophus Geoffroy, Entedon Dalman, Smaragdites Westwood, Derostenus Westwood, Closterocerus Westwood, Aprostocetus Westwood, Omphale Haliday and Cirrospilus Westwood.

Foerster (1856) in his "Hymenopterologische studien" proposed the families: (1) Elachistoidae for the genera Euplectrus Westwood, Elachistus Spinola, Aulogymnus Foerster, Olinx Foerster and Teleogmus Foerster; (2) Eulophoidae for the genera Cirrospilus Westwood, Melittobia Westwood, Solenotus Foerster, Eulophus Geoffroy and Sympiesis Foerster; (3) Entedonoidae for the genera Epiclerus Haliday, Rhopalotus Foerster, Astichus Foerster, Holcopelte Foerster, Euderus Walker, Secodes Foerster, Pleurotropis Foerster, Entedon Dalman, Asecodes Foerster, Omphale Haliday, Chrysocharis Foerster and Derostenus Westwood and (4) Tetrastichoidae for the genera Triphasius Foerster, Anozus Foerster, Pterothrix Westwood, Trichaporus

Foerster, Ceranisus Walker, Baryscapus Foerster, Hyperteles Foerster and Tetrastichus Haliday. Further, he gave a key to genera under each family. Walker (1872) named the families Elachistoidae, Eulophoidae, Entedonoidae and Tetrastichoidae as Elachistidae, Eulophidae, Entedonidae and Tetrastichidae respectively.

Thomson (1878) in his "Hymenoptera Scandinaviae" demoted the families as proposed by Foerster (1856) to the rank of tribes, Elachistina, Eulophina, Entedonina and Tetrastichina. Ashmead (1894) recognized Elachistinae, Eulophinae, Entedoninae and Tetrastichinae as subfamilies of Chalcididae. Later, he (1904 a) accepted family status of Eulophidae and treated Elachertinae (= Elachistoidae Foerster), Eulophinae, Entedoninae, Tetrastichinae and Aphelininae as its subfamilies. Further, he split the subfamilies into tribes viz.,

1. Elachertinae: Euplectrini, Ophelinini and Elachertini.
2. Eulophinae: Eulophini and Hemiptarsenini.
3. Entedoninae: Tetracampini, Entedonini, Omphalini and Pediobini.
4. Tetrastichinae: Ceratoneurini and Tetrastichini.
5. Aphelininae: Aphelinini and Pteroptricini.

He proposed several new genera under the family Eulophidae.

Girault (1913 b) adopted Ashmead's (1904 a) system of classification. He (1911-1926) proposed several genera under the family Eulophidae.

Waterston (1915 a) described four new species under four genera of the family Eulophidae from Ceylon. The same author (1915b, 1916, 1922b, 1925) described twenty two new species under seven genera of the family Eulophidae from African region.

Gahan and Fagan (1923) gave new names Giraultia and Secodoidea for the genera Cirrospilopsis Girault and Secodes Girault respectively.

Ferrière made some important contributions on Eulophidae from Asiatic (1930, 1931b), African (1931a, 1936, 1938), Oriental and Australian regions (1940a, 1940b). He (1941) proposed keys to genera and species of the tribe Euplectrini and also described two new genera and 40 species from Europe, Africa and Asia.

Mani (1938) in his "Catalogue of Indian insects, part 23 Chalcidoidea" adopted Ashmead's (1904a) system of classifying Eulophids into subfamilies and tribes. However, he gave to each tribe the ending ariae. He catalogued 67 species under 29 genera of the family Eulophidae. He (1976) accepted the family status of Eulophidae, Tetrastichidae and Elachertidae.

Ghesquière (1946) proposed new names Heteroscapiscus, Hyssopiscus, Metacrisinus, Microcaetiscus, Thymiscus and

Lopodytiscus for the genera Heteroscapus Brèthes, Hyssopus Girault, Metacrias Girault, Microcaetus Meunier, Thymus Girault and Lopodytes Rond. respectively. Gahan (1946) transfered the genus Paraspalangia Ashmead from Spalangiinae to Tetrastichinae.

Muesebeck et al. (1951) followed Ashmead (1904a) in dividing the family Eulophidae into five subfamilies: Elachertinae, Eulophinae, Entedontinae, Tetrastichinae and Aphelininae. They catalogued 613 species under 90 genera of Eulophidae from America and north of Mexico.

Risbec (1951) recognized three subfamilies: Elachertinae, Entedoninae and Eulophinae under the family Eulophidae. He split the subfamily Entedoninae into two tribes: Tetracampini and Omphalina, and left the subfamilies Elachertinae and Eulophinae undivided. He supressed the subfamily Tetrastichinae and transfered its genera to the tribe Omphalina of the subfamily Entedoninae. The same author (1952) demoted the subfamilies and tribes (excluding aphelinids) as recognized by Ashmead (1904a) under the family Eulophidae to the rank of tribes and subtribes respectively.

Nikol'skaya (1952) followed Foerster (1856) and Walker (1872) in recognizing Elachertidae (= Elachistoidae Foerster), Eulophidae, Entedontidae and Tetrastichidae as distinct families. She put Tetracampid genera: Foresterella Dalla Torre, Platynochilus

Westwood and Tetracampe Foerster under the family Entedontidae. Further, she provided a key to genera of U.S.S.R. under each family. Later this system was followed by Essig (1954).

Domenichini (1953) treated Elachertidae, Eulophidae, Entedonidae, Tetrastichidae and Tetracampidae as distinct families. His morphological studies on the abdomen of some representatives of the above families is of taxonomic significance. The same author (1965) accepted Tetrastichinae as subfamily and divided it into two tribes, Melittobiini and Tetrastichini. Further, he made a comprehensive study on the paleartic species of the genus Tetrastichus Haliday. The family status of Tetracampidae was later accepted by all the recent workers (Erdös, 1953, 1956; Bouček, 1958; Peck, 1963; Peck et al., 1964 and Sugonjaev, 1971).

Erdös (1956) recognised four subfamilies: Elachertinae, Eulophinae, Entedontinae and Tetrastichinae under the family Eulophidae. He followed Ashmead (1904 a) in dividing the subfamilies Elachertinae and Eulophinae into three and two tribes respectively. He recognized only three tribes: Entedontini Ashmead, Omphalini Ashmead and his new tribe Euderini under the subfamily Entedontinae, and did not make any attempt to classify the subfamily Tetrastichinae. He listed 363 species arranged under 58 genera of the family Eulophidae.

Graham (1959) raised the tribe Euderini to the rank of subfamily Euderinae and also gave keys to British genera and species of the subfamilies Elachertinae, Eulophinae, Entedontinae and Euderinae. The same author (1963) made some additions and corrections to the British list of Eulophidae and also described some new species under it. In (1971) he revised the British species of the genus Entedon Dalman. The subfamily status of Euderinae was later accepted by Askew (1968), Boucek (1963, 1977a) and Peck et al., (1964).

Kerrich (1960, 1963, 1970, 1973, 1974 & 1975) made important contributions on the family Eulophidae and proposed two genera (Platocharis and Schizocharis), several new species and some new combinations under it. His study is mainly based on the material mostly from the African region.

De Santis (1961) agreed Foerster (1856) in giving family status to Eulophidae, Tetrastichidae, Elachertidae and Entedontidae, and under each family he gave a list of Girault's privately published genera and species.

Miller (1962; 1964a,b; 1965c) gave illustrations of male genitalia of some Eulophid parasites. However, he did not make any attempt to show their taxonomic significance.

Peck (1963) in his "A catalogue of the Nearctic

Chalcidoidea" upholds Erdös (1956) in dividing the family Eulophidae into four subfamilies Eulophinae, Tetrastichinae, Entedontinae and Elachertinae. He catalogued 471 species grouped under 79 genera of the family Eulophidae.

Peck et al.(1964) recognized five subfamilies: Elachertinae, Eulophinae, Entedontinae, Euderinae and Tetrastichinae under the family Eulophidae. They split the subfamily Elachertinae into two tribes Elachertini and Euplectrini on the basis of length of hind tibial spurs. Further, they provided a key to 71 eulophid genera from Czechoslovakian region.

Burks (1965) supressed the family Elasmidae and accorded to it the rank of subfamily Elasminae under the family Eulophidae on the basis of 4-jointed tarsi, anteriorly extended condition of axillae, 3-segmented funicle of female antennae and numerous denticles of mandibles. He studied the North American species of Tetrastichus Haliday in 1943 and Pediobius Walker in 1966.

Boucek made some important contributions on the European genera and species of Eulophinae in 1959a, Euderinae in 1963 and Entedontinae in 1965. In 1976 he made a study on the African and Asiatic species of the genera Trichospilus and Cotterellia. He (1977 a) recognized Elachertini as tribe of

the subfamily Eulophinae. In the same year (1977 b) he gave a key to 17 genera of the subfamily Tetrastichinae mainly based on the presence or absence of, submedian grooves on scutellum, abdominal petiole, malar sutures, radiating striations above clypeal margin; number of, antennal segments, setae on mid lobe of mesonotum; length of, postmarginal vein, basitarsus and petiole; sclerotized and unsclerotized condition of gaster etc. as important characters.

In India some contributions on the family Eulophidae were made by Cameron (1913), Rohwer (1921), Ayyar (1921, 1925, 1927), Mahdihassan (1923), Mani (1938, 1939, 1941, 1942, 1976), Ferrière (1940 a), Cherian and Margabundhu (1942), Bhatnagar (1952), Kurian (1952, 1953 a,b, 1954), Narayanan (1960), Subba Rao and Sharma (1966), Dubey (1974), Kaul and Saraswat (1974) and Saraswat (1975, 1978). So far 132 species grouped under 34 genera have been recorded from India.

The present writer agrees with the recent workers in dividing the family Eulophidae into five subfamilies: Elachertinae, Eulophinae, Entedontinae, Tetrastichinae and Euderinae. However, he does not make any attempt to classify the subfamilies into tribes. The present writer suggested some additional generic characters of pronotum, subgenital plate and external female genitalia. The idea of searching new generic characters was taken from Alam's (1956, 1957)

publications on Aphelinidae and Encyrtidae. An attempt has also been made to show the taxonomic significance of male genitalia in the family Eulophidae.

The present study contains a detailed study of 9 genera and 32 species of Eulophidae, of which 28 species are new to science. Two genera viz., Allocerastichus Masi and Euderastichus Bouček, and one species viz., Pediobius obtusiceps Bouček are reported for the first time from India.

KEY TO SUBFAMILIES OF EULOPHIDAE WESTWOOD

(After Peck et al., 1964)

1. Prestigma smoothly joining submarginal vein to marginal (Peck et al., 1964, fig. 227); if wings dwarfed, then axilla not produced forward (Xanthellum) and parapsidal grooves sometimes absent (Hemiptarsenus). 2

__ Venation more or less interrupted between submarginal vein and prestigma, latter projecting basally to narrow apex of submarginal vein; if wings dwarfed, then axilla angularly produced along base of parapsidal groove. 3

2. Parapsidal grooves complete, deep throughout (Peck et al., 1964, figs. 218, 220, 223); male antenna always simple; abdomen sessile or petiolate. . . . . ELACHERTINAE Ashmead

__ Parapsidal grooves incomplete or only faintly indicated in posterior third; male antenna frequently branched; abdomen nearly always sessile. . . . . EULOPHINAE Westwood

3. Parapsidal furrows complete, narrow, similar throughout, more or less straight (Peck et al., 1964, figs. 234, 235); axilla angularly produced forward into scapula along parapsidal furrow; number of mesoscutal bristles variable; wing rarely dwarfed; submarginal vein with one or more bristles.4

__ Parapsidal furrows incomplete or posteriorly indicated only by more or less broad impression, rarely complete, then not similar throughout but usually linear and strongly bent outward anteriorly, deeper and very broad posteriorly; axilla rounded at anterior margin, rarely produced; mesoscutum often with two pairs of bristles only; abdomen sometimes petiolate; wings fully developed, submarginal vein with two bristles, marginal vein very long and radius very short. . . . . .ENTEDONTINAE Foerster

4. Scutellum usually with two longitudinal grooved lines (Peck et al., 1964, fig. 235), these only very rarely obliterated; postmarginal vein wanting or much reduced, radius not extremely short; wings rarely dwarfed.TETRASTICHINAE Foerster

__ Scutellum without grooved lines; postmarginal nearly always longer than radius, latter frequently very short; winged. . . . . .EUDERINAE Erdös

SUBFAMILY: TETRASTICHINAE FOERSTER

KEY TO SOME GENERA OF THE SUBFAMILY TETRASTICHINAE, BASED ON FEMALES

1. Malar sutures present (Bouček, 1977 b, fig. 7). 2

__ Malar sutures absent (Bouček, 1977 b, fig. 15); scutellum with submedian grooves. 5

2. Lower face without conspicuous sculptural striation radiating from clypeal margin; antennae inserted not well above lower level of eyes. 3

__ Lower face with conspicuous sculptural striation radiating from clypeal margin (Bouček, 1977 b, fig. 7); antennae inserted well above lower level of eyes; head strongly sclerotised; abdominal petiole usually distinct. . . . . .Ceratoneura Ashmead

3. Abdomen without distinct petiole; body and appendages normal. .4

__ Abdomen with elongate petiole; body and appendages long and slender. . . . . .Seyrigina Risbec

4. Mesoscutum with one median and scutellum with two submedian grooves (Pl. 1, fig. E; Pl. 2, fig. E; Pl. 3, fig. C; Pl. 5, fig. L; Pl. 7, fig. D). . . . . Tetrastichus Haliday

__ Mesoscutum and scutellum without grooves (Pl. 9, fig. A; Pl. 11, fig. E; Pl. 12, fig. C). . . . . Syntomosphyrum Foerster

5. Fore tibiae with single small spur; pronotum long and campanulate; ovipositor not exserted. . . . . Melittobia Westwood

__ Fore tibiae with two thick spurs (Bouček, 1977 b, fig. 11); body depressed; pronotum quadrangular (Peck et al. 1964, fig. 234); ovipositor exserted. . . . . .Crataepus Foerster

1. Genus Tetrastichus Haliday

Tetrastichus Haliday, 1843, Trans. Ent. Soc. London, 3: 297.
Type-species: Cirrospilus attalus Walker (Monobasic).

The genus Tetrastichus was proposed by Haliday (1843) with Cirrospilus attalus Walker as type species. Kurdjumov (1913) and Gahan (1925) synonymized the genera Baryscapus Foerster and Exurus Philippi respectively with Tetrastichus Haliday. Burks (1943) declared the genera: Epitetrastichus Girault, Aprostoceroloides Girault, Neomphaloidella Girault, Neotetrastichodes Girault, Neotetrastichus Perkins, Epomphaloides Girault and Blattotetrastichus Girault as synonyms of Tetrastichus Haliday. Graham (1961) synonymized the genus Tetrastichus Haliday with Aprostocetus Westwood. He arranged the species of the genus Aprostocetus into 21 groups: rhosaces (Walker), miser (Nees), sempronius (Erdös), coccinellae Kurdjumov, pubescens (Nees), microscopicus (Rondani), anysis (Walker), brevinervis (Zetterstedt), suevius (Walker), crino (Walker), brevicornis (Panzer), daira (Walker), evonymellae (Bouček), ecus (Walker), arundinis (Giraud), pausiris (Walker), caudatus Westwood, catius (Walker), lycidas (Walker), fulvipes (Foerster) and elongatus (Foerster). Peck (1963) revalidated the genus Tetrastichus Haliday and recognized 14 genera as its synonyms: Sphenolepis Nees, Trichoceras Ratzeburg, Geniocerus

Ratzeburg, Baryscapus Foerster, Oomyzus Rondani, Tetrastichodes Ashmead, Neotetrastichus Perkins, Epitetrastichus Girault, Neomphaloidella Girault, Neotetrastichodes Girault, Epomphaloides Girault, Aprostoceroloides Girault, Blattotetrastichus Girault and Anellaria Bakkendorf. Domenichini (1965) upholds Peck (1963) in recognizing Tetrastichus Haliday as valid genus and treated Aprostocetus Westwood as its synonym. He made a comprehensive study of 216 species of Tetrastichus from palearctic region and arranged them into 17 groups: galerucae (Fonscolombe), vacuna (Walker), pygmaeus (Nees), oreophilus Foerster, neglectus Domenichini, strobilanae (Ratzeburg), viridimaculatus (Fullaway), brevicornis (Panzer), miser (Nees), pubescens (Nees), microscopicus (Rondani), crino (Walker), daira (Walker), evonymellae (Bouček), ecus (Walker), pausiris (Walker) and fulvipes (Foerster). The last 10 groups were recognized by Graham himself under the genus Aprostocetus Westwood. This grouping of species is especially based on number of setae on submarginal vein; presence or absence of, median dents of clypeus, frontal suture, perispiracular carinae of propodeum; length of mid and hind legs; metallic or non metallic condition of body; shape of abdomen; number of setae on scutum etc. as important characters. Recently, Kostyukov (1977) discarded Graham's (1961) and Domenichini's (1965) system of dividing the genus into groups. Instead he divided the genus Tetrastichus into 17 subgenera: Musciformia, Tenthredophagus, Tetrastichus,

Ceccidotetrastichus, Tamarixia, Oomyzus, Baryscapus, Dzhanokmenia, Eutetrastichus, Sphenolepis, Burksia, Domenichinia, Minotetrastichus, Chrysotetrastichus, Syntomosphyrum, Anellaria and Trichoceras, mainly based on the characters as used by Domenichini (1965) in grouping of the species.

The distinguishing characters of this genus have been given by Domenichini (1965) and Bouček (1977 b). The present writer suggested some additional generic characters which are as follows: Pronotum formed of one sclerotic piece, anterior margin concave in middle (Pl. 1, fig. G; Pl. 3, fig. D; Pl. 5, figs. C & M; Pl. 7, figs. E & M); third valvulae movably articulated with second valvifers (Pl. 1, fig. J; Pl. 2, figs. H & O; Pl. 3, fig. G; Pl. 4, fig. D; Pl. 5, figs. G & P; Pl. 6, figs. D & L; Pl. 7, figs. I & Q; Pl. 8, fig. E); outer plates of ovipositor with submarginal ridge along dorsal margin (Pl. 1, fig. K; Pl. 2, figs. I & P; Pl. 3, fig. H; Pl. 4, fig. E; Pl. 5, figs. H & Q; Pl. 6, figs. E & M; Pl. 7, figs. J & P; Pl. 8, fig. F); subgenital plate broad, posterior margin with a notch in middle, notch followed by laterally directed ridges (Pl. 2, fig. J; Pl. 3, fig. I; Pl. 5, figs. I & R; Pl. 7, figs. K & R; Pl. 8, fig. G); male genitalia with gonobase as long as or longer than aedeagus, digitus short each with a single projection (Pl. 20, figs. A-I).

Ayyar (1921, 1925), Ayyar and Margabandhu (1934), Rohwer (1921), Mahdihassan (1923), Ferrière (1931), Mani (1942), Ranweera (1947 a & b), Bhatnagar (1952), Kurian (1952, 1953 a), Narayanan

et al. (1960), Subba Rao et al. (1967) and Saraswat (1975, 1978) described about 36 species of Tetrastichus Haliday from the Indian region. The present writer raised the total to 52 by adding 16 new species. Separate keys to Indian species of the genus Tetrastichus, based on females and males are provided. Inadequately described species are not incorporated in keys.

Key to some Indian species of Tetrastichus Haliday, based on females

1. Body brown or dark or particoloured. 2

__ Body and legs completely yellow; eyes red with 6 dark patches; pedicel shorter than first funicle segment; antennae with 3 ring segments; funicle segments 1-3 sub-equal in length, each twice as long as wide (Pl. 6, fig. H); scutum with 8 setae near each parapsidal furrow; costal cell shorter than marginal vein; submarginal and marginal veins with 7 and 14 setae respectively (Pl. 6, fig. J); first valvifers semicircular (Pl. 6, fig. K); third valvulae four times as long as wide, one-fourth the length of second valvifers (Pl. 6, fig. L). . . . . T. flavus sp. n.

2. Pedicel one-half or more the length of first funicle segment; first funicle segment less than four times as long as wide, shorter than scape and club separately. . .3

__ Pedicel less than one-half the length of first funicle segment; first funicle segment very long, seven times as long as wide, longer than scape and club separately; second funicle segment four and a half times as long as wide (Saraswat, 1975, fig. 12D); scutum with 3 setae near each parapsidal furrow; costal cell shorter than marginal vein; submarginal and marginal veins with 7 and 13 setae respectively. . . . .T. tritrichia Saraswat

3. Pedicel shorter than first funicle segment; scape not longer than basal two funicle segments together; costal cell usually shorter than marginal vein. 4

__ Pedicel as long as or longer than first funicle segment; scape usually longer than basal two funicle segments together; costal cell usually as long as or longer than marginal vein. 14

4. First funicle segment twice or more as long as wide, usually longer than third. 5

__ First funicle segment slightly longer than wide; funicle segments 1-3 subequal in length; antennae with 3 ring segments (Pl. 2, fig. A); costal cell shorter than marginal vein; submarginal and marginal veins with 3 and 13 setae respectively; disc with a line of setae running beneath the cubital hair line; third valvulae six times as long as wide, slightly less than one-half the length of second valvifers. . T. aligarhensis sp. n.

5. Scutum with 3-7 setae, arranged in single row near each parapsidal furrow. 6

__ Scutum with more than 11 setae, scattered or arranged in more than one row near each parapsidal furrow. 11

6. Costal cell as long as marginal vein; scutum with 3 setae near each parapsidal furrow. 7

__ Costal cell shorter than marginal vein; scutum with 4-7 setae near each parapsidal furrow. 8

7. Antennae with 2 ring segments; first funicle segment distinctly longer than second (Pl. 4, fig. G); club longer than preceding two funicle segments together; submarginal and marginal veins with 3 and 8 setae respectively. . . . . .T. nainitalensis sp. n.

__ Antennae with 1 ring segment; first funicle segment shorter than second (Kaul & Saraswat, 1974, fig. 3D); club shorter than preceding two funicle segments together; submarginal and marginal veins with 9 and 11 setae respectively. . . . . .T. krishnaiahi Saraswat

8. Body brownish or particoloured. 9

__ Body black with metallic bluish green reflections; first funicle segment less than three times as long as wide; club as long as preceding two funicle segments together; submarginal and marginal veins with 4 and 14 setae respectively. . . . . T. travancorensis Saraswat

9. Body particoloured; antennae with 3 ring segments;

first funicle segment more than three times as long as wide; scutum with 4-6 setae near each parapsidal furrow. 10

__ Body brown, non-metallic; antennae with 4 ring segments; first funicle segment less than three times as long as wide (Saraswat, 1975, fig. 10 D); scutum with 7 setae near each parapsidal furrow ; submarginal and marginal veins with 5 and 15 setae respectively. . . . . .T. shencottensis Saraswat

10. Scutum with 4 setae near each parapsidal furrow; funicle segment first slightly more than four times, second and third each slightly more than three times as long as wide (Saraswat, 1975, fig. 1 D); submarginal and marginal veins with 4 and 15 setae respectively. . . . . .T. bicolor Saraswat

__ Scutum with 6 setae near each parapsidal furrow; funicle segment first slightly more than three times, second and third each less than three times as long as wide (Saraswat, 1978, fig. 2 I); submarginal and marginal veins with 8 and 12 setae respectively. . . . . .T. satpurensis Saraswat

11. Costal cell shorter than marginal vein; pedicel more than one-half the length of first funicle segment; antennae with 3-4 ring segments. 12

__ Costal cell as long as marginal vein (Pl. 8, fig. C);

pedicel one-half the length of first funicle segment (Pl. 8, fig. B); antennae with 1 ring segment; scutum with 20 setae arranged in three rows near each parapsidal furrow; submarginal and marginal veins with 5 and 14 setae respectively; first valvifers semicircular with basal and apical angles in one plane (Pl. 8, fig. D); third valvulae long, eight times as long as wide, slightly less than one-half the length of second valvifers (Pl. 8, fig. E). T. magnicorpus sp. n.

12. Body yellowish brown, non metallic; first funicle segment less than three times as long as wide; scutum with less than 16 scattered setae on each side between parapsidal furrow and median groove. 13

__ Body dark with metallic bluish green reflections; first funicle segment more than three times as long as wide (Saraswat, 1978, fig. 1 E); scutum with 17 scattered setae on each side between parapsidal furrow and median groove (Saraswat, 1978, fig. 1 G); submarginal and marginal veins with 5 and 13 setae respectively. . . . . .T. chireni Saraswat

13. Submarginal and marginal veins with 8 and 14 setae respectively; antennae with 4 ring segments; eyes red. . . . . .T. polyseta Saraswat

__ Submarginal and marginal veins with 4 and 10 setae respectively; antennae with 3 ring segments; eyes reddish-brown. . . . . .T. malabarensis Saraswat

14. Submarginal vein with 1 or 2 setae; antennae with 1 ring segment. 15

__ Submarginal vein with 3-6 setae; antennae usually with 2-3 ring segments. 18

15. Ovipositor arising from base or mid of abdominal venter; outer plates of ovipositor shorter than second valvifers and third valvulae together; third valvulae long and narrow; more than five times as long as wide, more than one-fourth the length of second valvifers (Pl. 1, fig. J; Pl. 7, fig. I); posterior margin of pronotum without submarginal ridge (Pl. 1, fig. G; Pl. 7, fig. E); scutum with 2 or 3 setae near each parapsidal furrow..16

__ Ovipositor arising from apical one-third of abdominal venter; outer plates of ovipositor slightly longer than second valvifers and third valvulae together (Pl. 5, fig. H); third valvulae short, triangular, less than twice as long as wide, about one-fifth the length of second valvifers (Pl. 5, fig. G); posterior margin of pronotum with submarginal ridge bearing 4 pairs of setae (Pl. 5, fig. C); scutum with 7 setae near each parapsidal furrow; body dark with metallic reflections; legs yellow except coxae which are dark with metallic reflections; submarginal vein with 2 setae. . . . . .

. . . . . .T. metallicus sp.n.

16. Costal cell as long as marginal vein; scutum with 3

setae near each parapsidal furrow; first funicle segment longer than second; femora of mid and hind legs yellow. 17

__ Costal cell shorter than marginal vein; scutum with 2 setae near each parapsidal furrow; first funicle segment as long as second (Pl. 7, fig. C); femora dark; submarginal vein with 1 seta; first valvifers semicircular (Pl. 7, fig. H); third valvulae long, slightly less than one-half the length of second valvifers (Pl. 7, fig. I). . . . . T. longicorpus sp. n.

17. Abdomen yellow except lateral and apical portions of dorsum which are dark brown; submarginal vein with 1 seta; scape four times as long as wide; pedicel slightly longer than first funicle segment; first funicle segment less than twice as long as wide (Pl. 1, fig. C); club slightly more than twice as long as wide; eyes red; first valvifers triangular (Pl. 1, fig. I); third valvulae less than one-third the length of second valvifers (Pl. 1, fig. J). . . . . T. indicus sp. n.

__ Abdomen completely dark brown with metallic reflections; submarginal vein with 2 setae; scape slightly more than five times as long as wide; pedicel as long as first funicle segment; first funicle segment twice as long as wide; club twice as long as wide (Pl. 4, fig. L); eyes dark brown. . . . . .T. nigricorpus sp. n.

18. Thorax completely yellowish brown or particoloured, non metallic; abdomen yellow except dorsum with five dark brown transverse bands. 19

__ Thorax dark brown or dark with metallic reflections; abdomen usually dark except base which is yellow; first valvifers with inner margin usually much curved (Pl. 2, figs. G & N; Pl. 3, fig. F; Pl. 4, fig. C; Pl. 5, fig.O; Pl. 6, fig. C). 20

19. Thorax completely yellowish brown; eyes silvery white; antennae with 3 ring segments; costal cell shorter than marginal vein; submarginal and marginal veins with 4 and 10 setae respectively (Pl. 6, fig. P). T. flavidus sp. n.

__ Thorax dark except an U-shaped band on scutum, and scutellum completely which are yellowish; eyes red; antennae with 1 ring segment; costal cell as long as marginal vein; submarginal and marginal veins with 3 and 8 setae respectively (Pl. 7, fig. N); third valvulae long, seven times as long as wide, one-half the length of second valvifers (Pl. 7, fig. Q). T. maculatus sp. n.

20. Eyes red or dark brown; atleast one funicle segment of antennae one and a half times or more as long as wide. 21

__ Eyes silvery white; funicle segments 1-3 distinctly less than one and a half times as long as wide (Pl. 5, fig. K); submarginal and marginal veins with 3 and 8 setae respectively; posterior margin of pronotum straight,

posterior submarginal ridge distinct bearing 6 pairs of long setae (Pl. 5, fig. M); scutum with 3 setae near each parapsidal furrow; third valvulae three and a half times as long as wide, one-third the length of second valvifers (Pl. 5, fig. P). . . . . .T. ajmerensis sp. n.

21. Scutum with 4-7 setae near each parapsidal furrow; femora yellow; abdomen dark except base which is usually yellow; submarginal vein with 4 or 5 setae. 22

__ Scutum with 3 setae near each parapsidal furrow; femora, abdomen and antennae completely dark; funicle segments first and second twice as long as wide (Pl. 4, fig. J); submarginal and marginal veins with 5 and 9 setae respectively; ovipositor arising from base of abdominal venter. . . . . .T. nigricornis sp. n.

22. Costal cell as long as or shorter than marginal vein; scutum with 5-7 setae near each parapsidal furrow; outer plates of ovipositor narrow at apex (Pl. 2, figs. I & P; Pl. 4, fig. E; Pl. 6, fig. E). 23

__ Costal cell longer than marginal vein (Pl. 3, fig. E); scutum with 4 setae near each parapsidal furrow (Pl. 3, fig. C); outer plates of ovipositor obliquely truncated at apex (Pl. 3, fig. H); third valvulae six times as long as wide, more than one-third the length of second valvifers (Pl. 3, fig. G); first funicle segment shorter than pedicel and second funicle segment separately; submarginal and marginal veins with 4 and 9 setae

respectively. . . . . .T. ferrierei sp. n.

23. Submarginal vein with 4 setae; scutum with 5 or 7 setae near each parapsidal furrow; outer plates of ovipositor as long as second valvifers (Pl. 2, fig. P; Pl. 4, fig. E; Pl. 6, fig. E). 24

__ Submarginal vein with 5 setae; scutum with 6 setae near each parapsidal furrow; outer plates of ovipositor shorter than second valvifers (Pl. 2, fig. I); third valvulae one-fourth the length of second valvifers (Pl. 2, fig. H). . . . . .T. burksi sp. n.

24. Scutum with 5 setae near each parapsidal furrow; first funicle segment longer than following segments separately, second and third each less than twice as long as wide; third valvulae six times as long as wide, more than one-third the length of second valvifers (Pl. 4, fig. D; Pl. 6, fig. D). 25

__ Scutum with 7 setae near each parapsidal furrow; pedicel and funicle segments 1-3 subequal in length, each about twice as long as wide; third valvulae four times as long as wide, less than one-third the length of second valvifers (Pl. 2, fig. O). . . . .T. purpureus (Cameron)

25. Costal cell as long as marginal vein; antennae with 2 ring segments; scape six times as long as wide. . . . . .T. manmohani sp. n.

__ Costal cell shorter than marginal vein; antennae with

3 ring segments; scape four times as long as wide. . . . . T. annulicornis sp. n.

Key to some Indian species of Tetrastichus Haliday, based on males

1. Head and thorax completely dark or brown or particoloured; coxae usually dark or brown. 2

__ Head, thorax and legs completely yellow; flagellum with long hairs; scape flattened, two and a half times as long as wide, shorter than basal two funicle segments together; pedicel as long as first funicle segment; first funicle segment slightly longer than wide; funicle segments third and fourth subequal, each three times as long as wide; club seven times as long as wide, slightly longer than preceding two funicle segments together (Pl. 6, fig. N); genitalia with gonobase broadened in middle, two and a half times as long as wide, slightly longer than aedeagus, anterior margin of basal part triangular; digitus well developed, twice as long as wide; aedeagal shaft short and blunt (Pl. 20, fig. G). . . . . .T. flavus sp. n.

2. Flagellum with short hairs; antennae with one ring segment; first funicle segment shorter than second. . .3

__ Flagellum with long hairs; antennae with 1-3 ring

segments. 4

3. Scape as long as basal two funicle segments together; first funicle segment distinctly longer than wide; funicle segments 2-4 subequal in length, each less than twice as long as wide (Pl. 5, fig. J); genitalia with gonobase slightly more than three times as long as wide, about as long as aedeagus; digitus short, twice as long as wide; aedeagal shaft long (Pl. 20, fig. H). . . . .

aedeagus; digitus short, usually twice as long as wide; aedeagal shaft usually short and blunt (Pl. 20, figs. B-F & I). 6

__ Submarginal vein with one seta; male genitalia with gonobase long and narrow, five and a half times as long as wide, shorter than aedeagus, anterior margin of basal part narrow; digitus long, four times as long as wide, with a small projection; aedeagal shaft long and narrow (Pl. 20, fig. A); club six times as long as wide; antennae with one ring segment (Pl. 1, fig. L); scutum with 2 setae near each parapsidal furrow. . . . . .T. indicus sp. n.

6. Eyes red or reddish brown; male genitalia with gonobase elliptical in shape, anterior margin of basal part narrow (Pl. 20, figs. C-F). 7

__ Eyes silvery white; male genitalia with gonobase uniformly broad, two and a half times as long as wide, anterior margin of basal part rounded (Pl. 20, fig. I); scape two and a half times as long as wide (Pl. 5, fig. S); submarginal and marginal veins with 3 and 8 setae respectively. . . . . T. aimerensis sp. n.

7. Costal cell shorter than marginal vein; fore wings about twice as long as wide. 8

__ Costal cell as long as or longer than marginal vein; aedeagal shaft short and blunt. 11

8. Antennae with three ring segments; scutum with 5 setae near each parapsidal furrow. 9

__ Antennae with two ring segments; scutum with 4 setae near each parapsidal furrow. 10

9. Funicle segments 2-4 subequal in length, each 2.4 times as long as wide; club four and a half times as long as wide (Saraswat, 1975, fig. 2E); submarginal and marginal veins with 6 and 11 setae respectively (Saraswat, 1975, fig. 2 A); hind tibial spur equal to basitarsus (Saraswat, 1975, fig. 2 L). .T. kodaikanalensis Saraswat

__ Second funicle segment shorter than third and fourth separately, third longest; club five and a half times as long as wide (Saraswat, 1975, fig. 3 D); submarginal and marginal veins with 4 and 15 setae respectively (Saraswat, 1975, fig. 3 A); hind tibial spur shorter than basitarsus (Saraswat, 1975, fig. 3 K). . . . . .T. kumaonensis Saraswat

10. Funicle segments 2-4 subequal in length; scape two and a half times as long as wide, shorter than second and third funicle segments together; club longer than preceding two funicle segments together (Pl. 2, fig. C); aedeagal shaft long and narrow (Pl. 20, fig. B). . . . . T. aligarhensis sp. n.

__ Funicle segments second and fourth subequal in length, third longest; scape three and a half times as long as

wide, as long as second and third funicle segments together; club as long as preceding two funicle segments together (Pl. 6, fig. F); aedeagal shaft short and blunt (Pl. 20, fig. D). . . . . T. annulicornis sp. n.

11. Third funicle segment distinctly more than twice as long as wide, longer than fourth; pedicel, second and fourth funicle segments subequal in length (Pl. 2, fig. K). . . . . T. burksi sp. n.

__ Third funicle segment twice as long as wide, slightly shorter than fourth; pedicel and second funicle segment subequal in length, each distinctly shorter than fourth segment (Pl. 4, fig. F). . . . . T. manmohani sp. n.

12. First funicle segment shorter than second; costal cell shorter than marginal vein. 13

__ Funicle segments 1-3 subequal in length; costal cell as long as marginal vein; antennae with one ring segment; club longer than preceding two funicle segments together; scape two and a half times as long as wide (Pl. 4, fig. I); male genitalia with gonobase more or less elliptical in shape, slightly more than three times as long as wide, as long as aedeagus; digitus short, twice as long as wide; aedeagal shaft short and narrow (Pl. 20, fig. F). . . . . T. nainitalensis sp. n.

13. Face with scattered minute punctations (Saraswat, 1975, figs. 5 H, 6 F, 9 F & 13 F); scutum with 3 or 4 setae

near each parapsidal furrow. 14

__ Face smooth without puncts; scutum with 6 setae near each parapsidal furrow (Saraswat, 1978, fig. 3 G); antennae with 3 ring segments; submarginal and marginal veins with 4 and 13 setae respectively (Saraswat, 1978, fig. 3 C). . . . . T. satpurensis Saraswat

14. Postmarginal vein short with 1 or 2 setae, less than one-half the length of stigmal vein. 15

__ Postmarginal vein well developed with 4 setae, more than one-half the length of stigmal vein (Saraswat, 1975, figs. 9 A & B); scutum with 4 setae near each parapsidal furrow; antennae with 3 ring segments. . . . .T. quadriseta Saraswat

15. Antennae with 2-3 ring segments; first funicle segment less than three times as long as wide; postmarginal vein slightly developed. 16

__ Antennae with 1 ring segment; first funicle segment three and a half times as long as wide (Saraswat, 1975, fig. 13E); postmarginal vein absent (Saraswat, 1975, figs. 13 A & B). . . . . T. uniarticulata Saraswat

16. Submarginal vein with 3 setae directing in front; fore wings more than two and a half times as long as wide (Saraswat, 1975, figs. 5 A & B); scutum with 4 setae near each parapsidal furrow. . . . . T. nilamburensis Saraswat

__ Submarginal vein with 1 seta directing infront and 3 setae directing behind; fore wings less than two and a half times

as long as wide (Saraswat, 1975, figs. 6 A & B); scutum with 3 setae near each parapsidal furrow. , T. ootvensis Saraswat

Tetrastichus indicus sp. n.

(Plate 1, figs. A-L)

Female.

Head (fig. A).- Dark brown, wider than long in facial view (0.39:0.28 mm); frontovertex much wider, more than one-half the total head width; ocelli white, arranged in obtuse triangle, lateral ocelli more than their own diameters from orbital margin and less than their own diameters from occipital margin; eyes red and smooth; antennae inserted at lower level of eyes; prominence between antennal sockets one-third the width of frons between eyes; malar space longer than eye width; malar sutures distinct; lower margin of clypeus without dents medially; mandibles tridentate with apical tooth acute, mesal rounded and lower rudimentary (fig. B); maxillary and labial palpi each 1-segmented (fig. D).

Antennae (fig. C).- Yellowish brown, 8-segmented excluding one ring segment; scape cylindrical, four times as long as wide (0.12:0.03 mm), longer than basal two funicle segments together; pedicel twice as long as wide, slightly longer than first funicle segment; funicle 3-segmented, segments 1-3 gradually decreasing in length distad; first funicle segment

one and a half times as long as wide, second slightly longer than wide, third as long as wide; club 3-segmented, slightly more than two times as long as wide, longer than preceding two funicle segments together.

Thorax (fig. E).- Dark brown; pronotum with posterior margin slightly convex and with 4 pairs of setae, anterior margin concave in middle (fig. G); parapsidal furrows complete; scutum with a mid-longitudinal groove and 3 setae in single row near each parapsidal furrow; scutellum slightly shorter than scutum with two submedian grooves and 2 pairs of setae, posterior margin rounded; each parapside with single seta; mesopostphragma not reaching beyond the propodeum; propodeum with a well developed median carina.

Fore wings (fig. F).- Hyaline, slightly less than two and a half times as long as wide, apex broadly rounded; costal cell as long as marginal vein and with 2 small setae; submarginal and marginal veins with 1 and 8 setae respectively; postmarginal vein absent; marginal fringe short, spaced by a distance equal to one-fourth their length.

Hind wings.- Hyaline, six times as long as wide (0.74: 0.12 mm); marginal fringe long, one-half the wing width, spaced by a distance equal to one-sixth their length.

Legs.- Yellow except coxae and pretarsus which are brownish; tarsi 4-jointed; pretarsus longer than tarsal joints

1-3 separately; middle tibial spur shorter than basitarsus.

Abdomen (fig. H).- Yellow except lateral and apical portions of dorsum which are dark brown, as long as head and thorax together (0.56:0.56 mm); ovipositor concealed, arising from base of abdominal venter; first valvifers triangular with basal and apical angles at different levels (fig. I); second valvifers long, more or less of uniform width; third valvulae movably articulated with second valvifers, less than one-third the length of second valvifers (fig. J); outer plates of ovipositor shorter than the length of second valvifers and third valvulae together, narrow at apex (fig. K).

Female length: 1.13 mm.

Male.

Head.- Brown, distinctly wider than long in facial view; frontovertex much wider, more than one-half the total head width; ocelli white, arranged in obtuse triangle, lateral ocelli more than their own diameters from orbital margin and their own diameters from occipital margin; eyes red and smooth; malar space longer than eye width; malar sutures distinct; mandibles tridentate with apical tooth acute, mesal rounded and lower rudimentary; maxillary and labial palpi each 1-segmented; lower margin of clypeus without dents medially.

Antennae (fig. L).- Yellowish brown, 9-segmented excluding one ring segment; flagellum with long hairs; scape

broad at base and narrowing apically, slightly more than three times as long as wide, longer than basal two funicle segments together; pedicel one and a half times as long as wide, longer than first funicle segment; funicle 4-segmented; first funicle segment as long as wide; segments second and fourth subequal, each one and a half times as long as wide; third longest, twice as long as wide; club 3-segmented, six times as long as wide, longer than preceding two funicle segments together.

Thorax.- Brown; posterior margin of pronotum with 4 pairs of setae; parapsidal furrows complete; scutum with a mid-longitudinal and scutellum with two submedian grooves; propodeum with a well developed median carina.

Fore wings.- Hyaline, slightly less than two and a half times as long as wide; costal cell as long as marginal vein; submarginal and marginal veins with 1 and 8 setae respectively; postmarginal vein absent.

Hind wings.- Hyaline, six times as long as wide; marginal fringe more than one-half the wing width, spaced by a distance equal to one-sixth their length.

Legs.- Yellowish except coxae which are brown; tarsi 4-jointed; pretarsus longer than tarsal joints 1-3 separately; middle tibial spur shorter than basitarsus.

Abdomen.- Yellow except lateral and apical portions which

PLATE 1

Figs. A-L. *Tetrastichus indicus* sp. n.

A. Head, in facial view, ♀

B. Mandible, ♀

C. Antenna, ♀

D. Maxillary and labial palpi, ♀

E. Propodeum and part of thorax in dorsal view, ♀

F. Fore wing, ♀

G. Pronotum, ♀

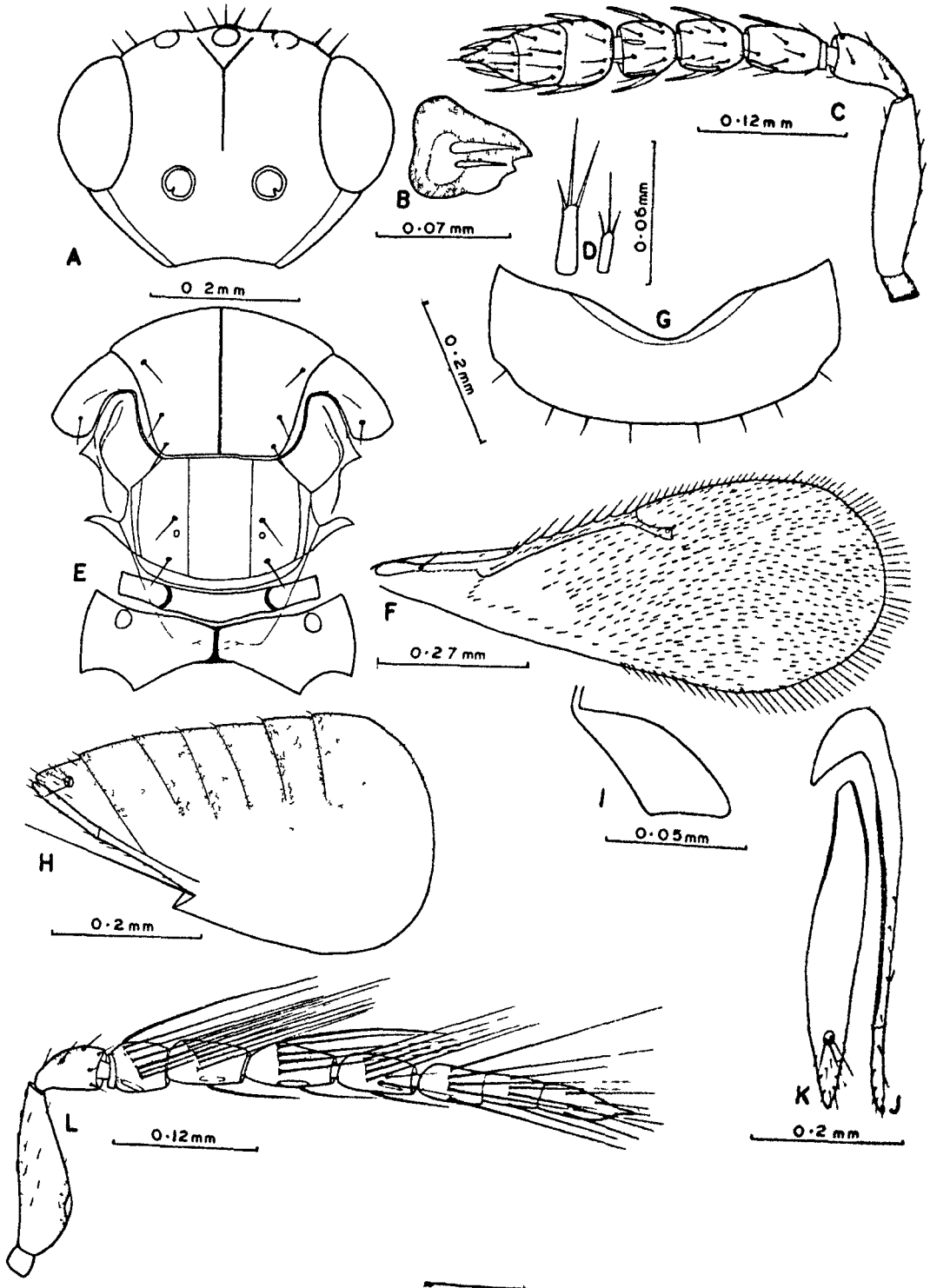
H. Abdomen in lateral view, ♀

I. First valvifer , ♀

J. Second valvifer and third valvula, ♀

K. Outer plate of ovipositor, ♀

L. Antenna, ♂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G
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F
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H
0·2mm
I
0·05mm
J
K
0·2 mm
L
0·12mm

PLATE I

are brown, as long as head and thorax together; genitalia with gonobase long and narrow, five and a half times as long as wide, shorter than aedeagus, anterior margin of basal part narrow; digitus long, four times as long as wide each with a small projection; aedeagal shaft long and narrow (Pl. 20, fig. A).

Male length: 1.03 mm.

Holotype ♀. INDIA: Tamil Nadu, Madurai, ex Mealy bugs on Cassia sp., 9.iii.1975 (M. Younus Khan).

Paratypes. 5 ♀, 3 ♂ (same data as holotype).

Tetrastichus aligarhensis sp. n.

(Plate 2, figs. A-C)

Female.

Resembles T. indicus sp. n. except in the following characters:

Head.- Lateral ocelli three times their own diameters from orbital margin; antennae inserted just above lower level of eyes; prominence between antennal sockets one-fifth the width of frons between eyes; lower margin of clypeus with two dents medially.

Antennae (fig. A).- Scape three and a half times as long as wide, shorter than basal two funicle segments together;

pedicel slightly longer than wide, shorter than first funicle segment; three small ring segments distinct; funicle segments 1-3 subequal in length, first slightly longer than wide, second and third each one and a half times as long as wide; club three and a half times as long as wide.

Thorax.- Posterior margin of pronotum with 8 pairs of setae; scutum with 4 setae near each parapsidal furrow; each parapside with 2 setae.

Fore wings.- Slightly more than twice as long as wide; costal cell shorter than marginal vein and with 13 setae; submarginal and marginal veins with 3 and 13 setae respectively; postmarginal vein rudimentary (fig. B); disc with a line of setae running beneath the cubital hair line.

Hind wings.- Five times as long as wide (0.94:0.18 mm).

Legs.- Yellow except fore coxae which are brown; middle tibial spur as long as basitarsus.

Abdomen.- Dark brown except base of venter which is yellow; ovipositor arising from basal one-third of abdominal venter; first valvifers semicircular; third valvulae six times as long as wide, slightly less than one-half the length of second valvifers.

Female length: 1.44 mm.

Male.

Resembles T. indicus sp. n. except in the following characters:

Head dark with metallic reflections; lower margin of clypeus with two dents medially. Antennal scape cylindrical, two and a half times as long as wide, shorter than second and third funicle segments together; pedicel slightly longer than wide; two ring segments distinct; funicle segments 2-4 subequal in length, each less than twice as long as wide; club four times as long as wide (fig. C). Thorax dark with metallic reflections; posterior margin of pronotum with 7 pairs of setae; scutum with 4 setae near each parapsidal furrow. Fore wings twice as long as wide; costal cell shorter than marginal vein and with 13 setae; submarginal and marginal veins with 4 and 13 setae respectively. Legs with fore coxae brown; middle tibial spur as long as basitarsus. Abdomen brown except base of venter which is yellow; genitalia with gonobase widened in apical half, less than three times as long as wide, as long as aedeagus; digitus short, narrow at base and widened apically, two times as long as wide (Pl. 20, fig. B).

Male length: 1.09 mm.

Holotype ♀. INDIA: Uttar Pradesh, Aligarh, ex coccinellid larvae on Aphis sp., on Brassica sp., 16.ii.1975 (M. Younus Khan).

Paratypes. 26 ♀, 3 ♂ (same data as holotype).

This species is more closely related to T. coccinellae Kurdjumov, but the female differs from it in having metallic body, antennae with 3 ring segments, funicle segments 1-3 distinctly longer than wide, submarginal with 3 and marginal vein with 13 setae, stigmal vein one-fourth the marginal vein.

Tetrastichus burksi sp. n.

(Plate 2, figs. D-K)

Female.

Resembles T. indicus sp. n. except in the following characters:

Head.- Dark with metallic reflections; antennae inserted just above lower level of eyes; prominence between antennal sockets one-fourth the width of frons between eyes; lower margin of clypeus with two dents medially.

Antennae (fig. D).- Brownish except scape which is yellow; scape four and a half times as long as wide (0.22:0.05 mm); pedicel as long as first funicle segment; three ring segments distinct; funicle segments first and second subequal in length, each slightly less than twice as long as wide, third distinctly longer than wide.

Thorax (fig. E).- Dark with metallic reflections; posterior margin of pronotum with 7 pairs of setae; scutum with

6 setae near each parapsidal furrow; each parapside with 4 setae; scutellum more than one-half the length of scutum.

Fore wings.- About twice as long as wide; costal cell with 12 setae; submarginal and marginal veins with 5 and 10 setae respectively; postmarginal vein rudimentary (fig. F); disc with a line of setae running beneath the cubital hair line.

Hind wings.- Four and a half times as long as wide.

Legs.- Yellow except fore coxae which are dark with metallic reflections.

Abdomen.- Dark with metallic reflections except base which is yellow, longer than head and thorax together (0.89: 0.68 mm); ovipositor exserted; first valvifers semicircular (fig. G); third valvulae six times as long as wide, one-fourth the length of second valvifers (fig. H); outer plates of ovipositor shorter than second valvifers (fig. I); subgenital plate broad, posterior margin with a notch in middle (fig. J).

Female length: 1.57 mm.

Male.

Resembles T. indicus sp. n. except in the following characters:

Head dark with metallic reflections; lower margin of clypeus with two dents medially. Antennal scape three times as

long as wide; pedicel as long as fourth funicle segment; two ring segments distinct; funicle segments second and fourth subequal in length, each slightly less than twice as long as wide; third more than twice as long as wide, longer than fourth; club five times as long as wide (fig. K). Thorax dark with metallic reflections; posterior margin of pronotum with 7 pairs of setae; scutum with 4 setae near each parapsidal furrow. Fore wings with submarginal and marginal veins having 4 and 9 setae respectively. Legs yellow except fore coxae which are brown. Abdomen dark except base which is yellow; genitalia with gonobase elliptical in shape, three times as long as wide, longer than aedeagus; digitus narrow at base, widened at apex, twice as long as wide; aedeagal shaft short and blunt (Pl. 20, fig. C).

Male length: 1.07 mm.

Holotype ♀. INDIA: Uttar Pradesh, Aligarh, ex Cerococcus hibisci Green on Hibiscus rosa-sinensis Linn., 18.ix.1974 (M. Younus Khan).

Paratypes. 5 ♀, 3 ♂ (same data as holotype).

This species is named for Dr. B.D. Burks in recognition of his contributions to our knowledge of the Chalcidoidea.

Tetrastichus purpureus (Cameron)

(Plate 2, figs. L-P)

Hadrothrix purpurea Cameron, 1913, Indian For. Rec., 4: 91-110.

Tetrastichus purpureus (Cameron); Ferrière, 1928, Bull. ent. Res., 19: 174.

Tetrastichus immsii Mahdihassan; Ferrière, 1928, Bull. ent. Res. 19: 174.

Female.

Resembles T. indicus sp. n. except in the following characters:

Head.- Dark with metallic reflections; antennae inserted just above lower level of eyes; prominence between antennal sockets one-fifth the width of frons between eyes; lower margin of clypeus with two dents medially.

Antennae (fig. L).- Brown except scape which is yellow; scape as long as basal two funicle segments together; pedicel as long as first funicle segment; two ring segments distinct; funicle segments 1-3 subequal in length, each about twice as long as wide; club three times as long as wide, shorter than preceding two funicle segments together.

Thorax.- Dark with metallic reflections; scutum with 7 setae near each parapsidal furrow.

PLATE 2

Figs. A-C. Tetrastichus aligarhensis sp. n.

A. Antenna, ♀

B. Fore wing venation, ♀

C. Antenna, ♂

Figs. D-K. Tetrastichus burksi sp. n.

D. Antenna, ♀

E. Part of thorax in dorsal view, ♀

F. Fore wing venation, ♀

G. First valvifer, ♀

H. Second valvifer and third valvula, ♀

I. Outer plate of ovipositor, ♀

J. Subgenital plate, ♀

K. Antenna, ♂

Figs. L-P. Tetrastichus purpureus (Cameron)

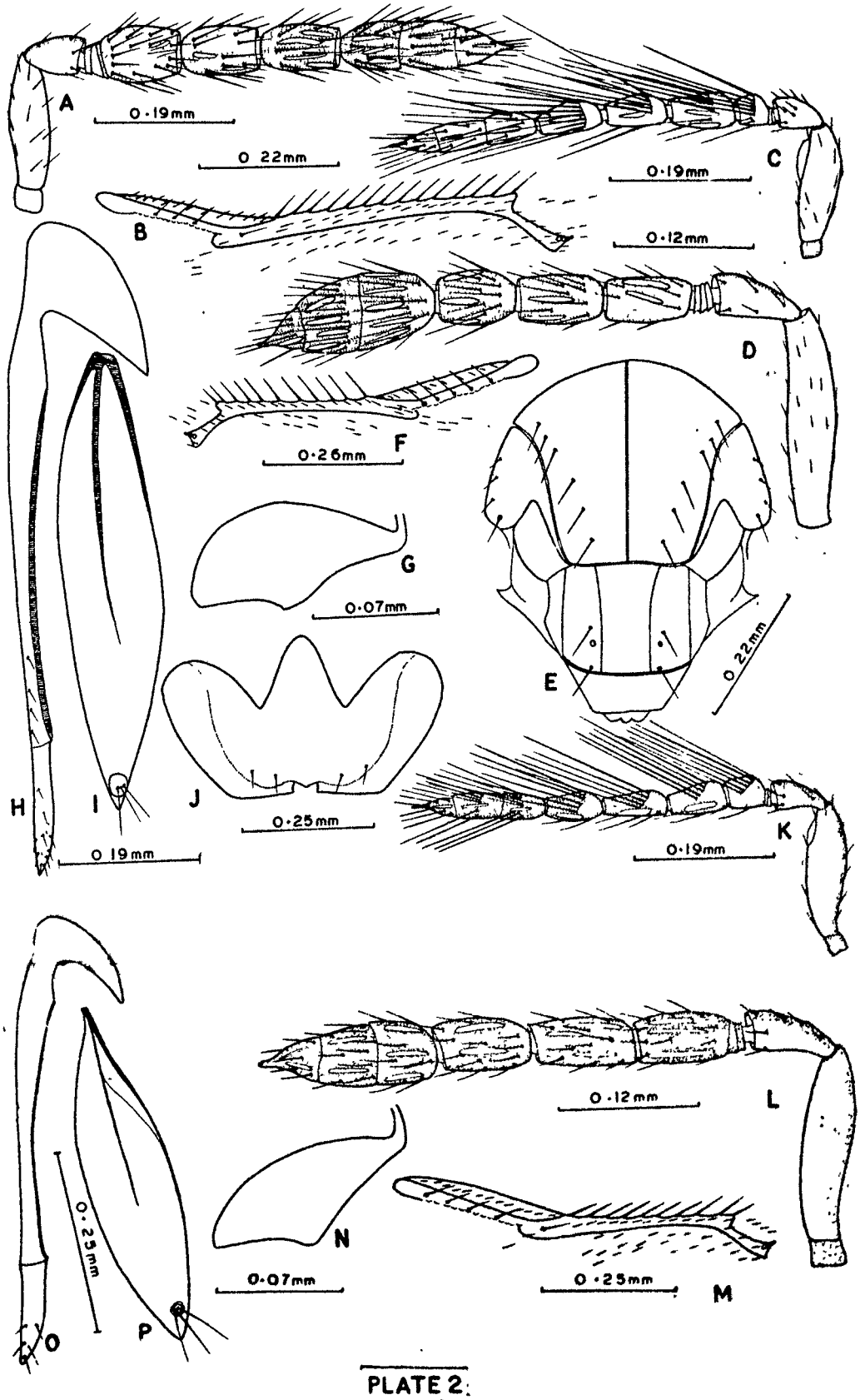
L. Antenna, ♀

M. Fore wing venation, ♀

N. First valvifer, ♀

O. Second valfifer and third valvula, ♀

P. Outer plate of ovipositor, ♀


A
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0·19mm
C
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D
F
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G
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E
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0·25mm
0 19mm
K
0·19mm
0·12mm
L
N
0·07mm
0·25mm
M
0·25mm
O
P

PLATE 2.

Fore wings.- Less than twice as long as wide (1.06:0.66 mm); costal cell with 13 setae; submarginal and marginal veins with 4 and 9 setae respectively; postmarginal vein rudimentary (fig. M); disc with a line of setae running beneath the cubital hair line.

Hind wings.- Four and a half times as long as wide.

Legs.- Middle tibial spur as long as basitarsus.

Abdomen.- Dark with metallic reflections; ovipositor arising from mid of abdominal venter; third valvulae four times as long as wide, less than one-third the length of second valvifers (fig. O); outer plates of ovipositor as long as second valvifers (fig. P).

Female length: 1.43 mm.

Material examined.- 4 ♀, INDIA: Uttar Pradesh, Aligarh, University Campus, ex Kerria lacca (Kerr) on Ficus sp., 2.vii. 1975 (M. Younus Khan).

Tetrastichus ferrierei sp. n.

(Plate 3, figs. A-I)

Female.

Resembles T. indicus sp. n. except in the following characters:

Head.- Dark with metallic bluish reflections except postocellar region which is yellow; antennae inserted just above lower level of eyes; prominence between antennal sockets one-fourth the width of frons between eyes; lower margin of clypeus with two dents medially.

Antennae (fig. B).- Scape five times as long as wide, much longer than basal two funicle segments together; pedicel slightly less than twice as long as wide; two ring segments distinct; first funicle segment slightly longer than wide, shorter than pedicel and second funicle segment separately; funicle segments second and third subequal, each one and a half times as long as wide.

Thorax (fig. C).- Dark with metallic reflections; posterior margin of pronotum straight with 7 pairs of long setae (fig. D); scutum with 4 setae near each parapsidal furrow; scutellum slightly more than one-half the length of scutum.

Fore wings.- Costal cell longer than marginal vein and with 4 small setae; submarginal and marginal veins with 4 and 9 setae respectively (fig. E); marginal fringe spaced by a distance equal to one-sixth their length; disc with a line of setae running beneath the cubital hair line.

Legs.- Middle tibial spur as long as basitarsus.

Abdomen.- Dark with metallic reflections except a

Head.- Dark with metallic bluish reflections except postocellar region which is yellow; antennae inserted just above lower level of eyes; prominence between antennal sockets one-fourth the width of frons between eyes; lower margin of clypeus with two dents medially.

Antennae (fig. B).- Scape five times as long as wide, much longer than basal two funicle segments together; pedicel slightly less than twice as long as wide; two ring segments distinct; first funicle segment slightly longer than wide, shorter than pedicel and second funicle segment separately; funicle segments second and third subequal, each one and a half times as long as wide.

Thorax (fig. C).- Dark with metallic reflections; posterior margin of pronotum straight with 7 pairs of long setae (fig. D); scutum with 4 setae near each parapsidal furrow; scutellum slightly more than one-half the length of scutum.

Fore wings.- Costal cell longer than marginal vein and with 4 small setae; submarginal and marginal veins with 4 and 9 setae respectively (fig. E); marginal fringe spaced by a distance equal to one-sixth their length; disc with a line of setae running beneath the cubital hair line.

Legs.- Middle tibial spur as long as basitarsus.

Abdomen.- Dark with metallic reflections except a

PLATE 3

Figs. A-I. *Tetrastichus ferrierei* sp. n.

A. Mandible, ♀

B. Antenna, ♀

C. Propodeum and part of thorax in dorsal view, ♀

D. Pronotum, ♀

E. Fore wing venation, ♀

F. First valvifer, ♀

G. Second valvifer and third valvula, ♀

H. Outer plate of ovipositor, ♀

I. Subgenital plate, ♀

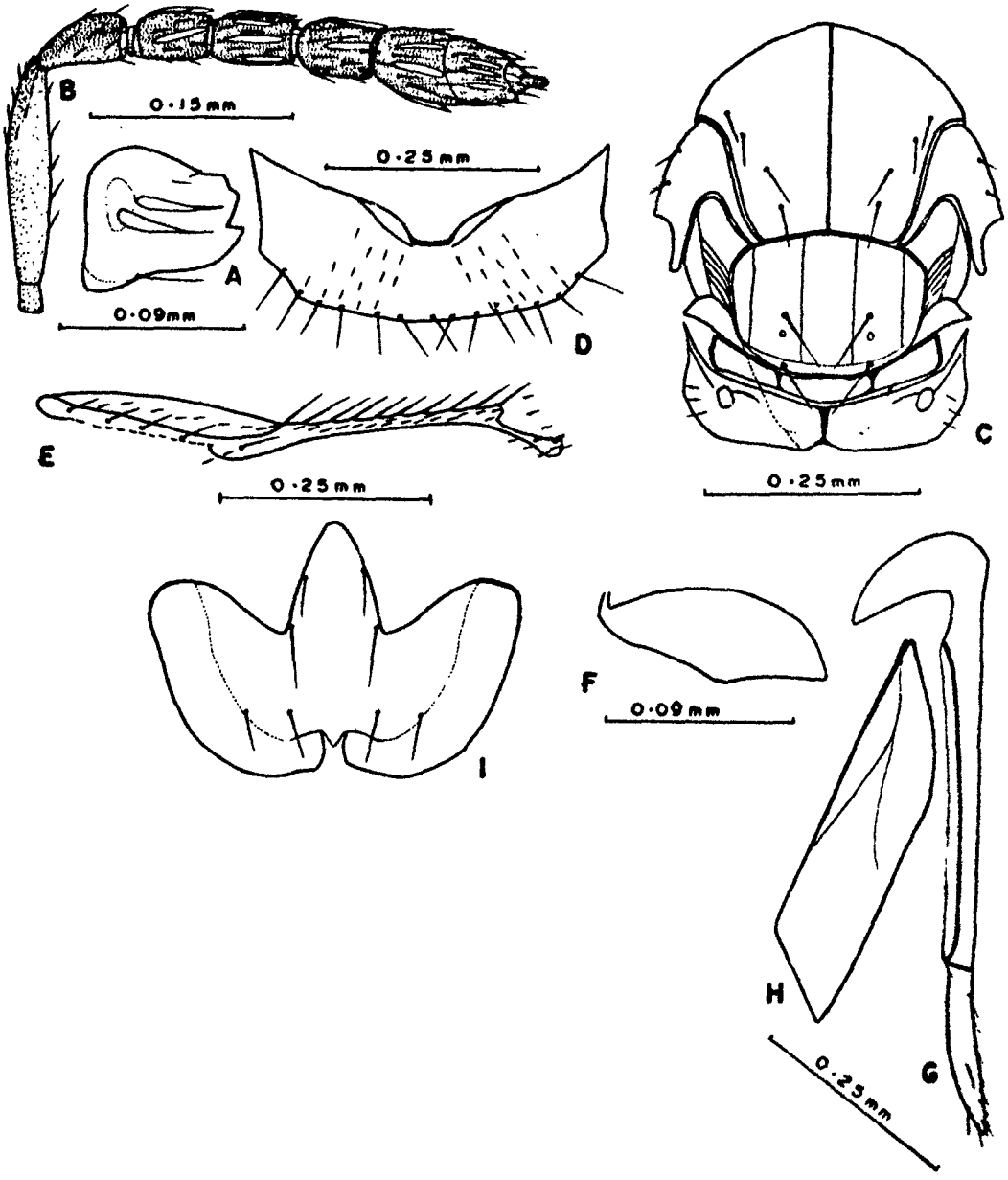

PLATE 3

transverse band on base of dorsum which is yellow; longer than head and thorax together (0.65:0.55 mm); ovipositor slightly exserted; first valvifers semicircular (fig. F); third valvulae six times as long as wide, more than one-third the length of second valvifers (fig. G); outer plates of ovipositor shorter than second valvifers, obliquely truncated at apex (fig. H); subgenital plate broad, posterior margin with a notch in middle, notch followed by laterally directed ridges (fig. I).

Female length: 1.26 mm.

Holotype ♀. INDIA: Maharastra, Poona, ex Pulvinaria maxima Green on Nerium sp., 2.v.1976 (M. Younus Khan).

Paratypes. 22 ♀ (same data as holotype).

This species is named for Dr. Ch. Ferrière in recognition of his contributions to our knowledge of the Chalcidoidea.

Tetrastichus manmohani sp. n.

(Plate 4, figs. A-F)

Female.

Resembles T. indicus sp. n. except in the following characters:

Head.- Dark with metallic reflections; eyes dark brown.

Antennae (fig. A).- Brownish except scape which is yellow; scape six times as long as wide; pedicel as long as first funicle segment; two ring segments distinct; first funicle segment slightly more than one and a half times as long as wide; third slightly longer than wide; club about as long as preceding two funicle segments together.

Thorax.- Dark with metallic reflections; posterior margin of pronotum with 9 pairs of setae; scutum with 5 setae near each parapsidal furrow; scutellum slightly more than one-half the length of scutum.

Fore wings.- Twice as long as wide (0.94:0.45 mm); costal cell with 10 setae; submarginal and marginal veins with 4 and 9 setae respectively; postmarginal vein rudimentary (fig. B); disc with a line of setae running beneath the cubital hair line.

Hind wings.- Four and a half times as long as wide.

Legs.- Yellowish except fore coxae which are brown.

Abdomen.- Dark except base which is yellow; ovipositor exserted; first valvifers semicircular (fig. C); third valvulae seven times as long as wide, more than one-third the length of second valvifers (fig. D); outer plates of ovipositor as long as second valvifers (fig. E).

Female length: 1.46 mm.

Male.

Resembles T. indicus sp. n. except in the following characters:

Head dark with metallic reflections. Antennae with two ring segments; pedicel and second funicle segment subequal in length, each distinctly shorter than fourth; third funicle segment twice as long as wide, slightly shorter than fourth; club three and a half times as long as wide, as long as preceding two funicle segments together (fig. F). Thorax dark with metallic reflections. Fore wings twice as long as wide; submarginal and marginal veins with 3 and 8 setae respectively. Legs yellow; middle tibial spur as long as basitarsus. Abdomen dark with metallic reflections except base which is yellow ; genitalia with gonobase elliptical in shape, three times as long as wide, longer than aedeagus; digitus twice as long as wide, aedeagal shaft short and blunt (Pl. 20, fig. E).

Male length: 1.2 mm.

Holotype ♀. INDIA: Rajasthan, Jaipur, ex Coccidohystrix insolitus (Green) on Solanum nigrum, 28.ix.1975 (M. Younus Khan).

Paratypes. 3 ♀, 1 ♂ (same data as holotype).

This species is named for Dr. Man Mohan Agrawal in recognition of his contributions to our knowledge of the Chalcidoidea.

Tetrastichus nainitalensis sp.n.

(Plate 4, figs. G-I)

Female.

Resembles T. indicus sp.n. except in the following characters:

Head.- Dark with metallic reflections except a small yellow patch infront of median ocellus; antennae inserted just above lower level of eyes.

Antennae (fig. G).- Yellowish; scape three and a half times as long as wide, shorter than basal two funicle segments together; pedicel slightly longer than wide, much shorter than first funicle segment; two ring segments distinct; first funicle segment twice as long as wide, much longer than second and third segments separately; second and third funicle segments subequal, each one and a half times as long as wide; club four times as long as wide (0.16:0.04 mm).

Thorax.- Dark with metallic reflections; scutellum more than one-half the length of scutum.

Fore wings.- Twice as long as wide (0.86:0.43 mm); costal cell with 9 setae; postmarginal vein developed; submarginal, marginal and postmarginal veins with 3, 8 and 2 setae respectively (fig. H); disc with a line of setae running beneath the cubital

hair line.

Abdomen.- Dark with metallic reflections; ovipositor slightly exserted, arising from basal one-third of abdominal venter.

Female length: 1.3 mm.

Male.

Resembles T. indicus sp.n. except in the following characters:

Head dark with metallic reflections. Antennal scape two and a half times as long as wide, shorter than basal two funicle segments together; pedicel shorter than first funicle segment; funicle segments 1-3 subequal in length, each one and a half times as long as wide; club five times as long as wide (fig. I). Thorax dark brown with metallic reflections; submarginal and marginal veins with 3 and 8 setae respectively; postmarginal vein well developed. Abdomen brown except venter which is yellow; genitalia with gonobase more or less elliptical in shape, slightly more than three times as long as wide, as long as aedeagus; digitus short, twice as long as wide; aedeagal shaft short and narrow (Pl. 20, fig. F).

Male length: 1.05 mm.

Holotype ♀. INDIA: Uttar pradesh, Nainital, pantnagar,

ex Kerria lacca (Kerr) on Mangifera indica Linn., 26.vi.1976 (M. Younus Khan).

Paratypes. 1 ♀ , 1 ♂ (Same data as holotype).

Tetrastichus nigricornis sp.n.

(Plate 4, figs. J & K)

Female.

Resembles T. indicus sp.n. except in the following characters:

Head.- Dark with metallic reflections; prominence between antennal sockets about one-third the width of frons between eyes.

Antennae (fig. J).- Dark; scape four and a half times as long as wide; pedicel as long as first funicle segment; two ring segments distinct; funicle segments first and second subequal in length, each twice as long as wide, third one and a half times as long as wide, shorter than first and second separately; club slightly more than twice as long as wide (0.12:0.05 mm.).

Thorax.- Dark with metallic reflections; scutellum one-half the length of scutum.

Fore wings.- Slightly more than twice as long as wide (1.38:0.63 mm.); costal cell with 6 setae; submarginal and marginal veins with 5 and 9 setae respectively; postmarginal vein

rudimentary (fig. K); disc with a line of setae running beneath the cubital hair line.

Hind wings.- Four times as long as wide; marginal fringe spaced by a distance equal to one-fourth their length.

Legs.- Dark except tibiae and basal three tarsal joints which are yellow.

Abdomen.- Dark with metallic reflections; ovipositor slightly exserted.

Female Length: 1.6 mm.

Holotype ♀. INDIA: Uttar Pradesh, Aligarh ex Nipaecoccus vastator (Maskell) on citrus sp., 10.ii.1976 (M. Younus Khan).

Paratypes. 2 ♀ (Same data as holotype).

Tetrastichus nigricorpus sp.n.

(Plate 4, figs. L & M)

Female.

Resembles T. indicus sp.n. except in the following characters:

Head.- Dark with metallic reflections; eyes dark brown.

Antennae (fig. L).- Dark except scape which is yellow;

scape slightly more than five times as long as wide (0.22:0.04 mm.), as long as funicle; pedicel slightly more than twice as long as wide, as long as first funicle segment; first funicle segment twice as long as wide; club twice as long as wide (0.16:0.08 mm).

Thorax.- Dark with metallic reflections; scutellum about as long as scutum; propodeum well developed.

Fore wings.- Slightly less than two and a half times as long as wide (1.2:0.5 mm); costal cell with 11 setae; submarginal and marginal veins with 2 and 10 setae respectively (fig. M); disc with a line of setae running beneath the cubital hair line.

Hind wings.- Four times as long as wide.

Legs.- Yellow except coxae and femora of fore legs which are dark brown; middle tibial spur less than one-half the length of basitarsus.

Abdomen.- Dark with metallic reflections; ovipositor slightly exserted.

Female length: 1.51 mm.

Holotype ♀.INDIA: Uttar Pradesh, Aligarh, University Botanical Garden, ex Nipaecoccus vastator (Maskell) on Ziziphus sp., 10.11.1976 (M. Younus Khan).

Paratype. 1 ♀ (Same data as holotype).

PLATE 4

Figs. A-F. *Tetrastichus manmohani* sp. n.

A. Antenna, ♀

B. Fore wing venation, ♀

C. First valvifer, ♀

D. Second valvifer and third valvula, ♀

E. Outer plate of ovipositor, ♀

F. Antenna, ♂

Figs. G-I. *Tetrastichus nainitalensis* sp. n.

G. Antenna, ♀

H. Fore wing venation, ♀

I. Antenna, ♂

Figs. J & K. *Tetrastichus nigricornis* sp. n.

J. Antenna, ♀

K. Fore wing venation, ♀

Figs. L & M. *Tetrastichus nigricorpus* sp. n.

L. Antenna, ♀

M. Fore wing venation, ♀

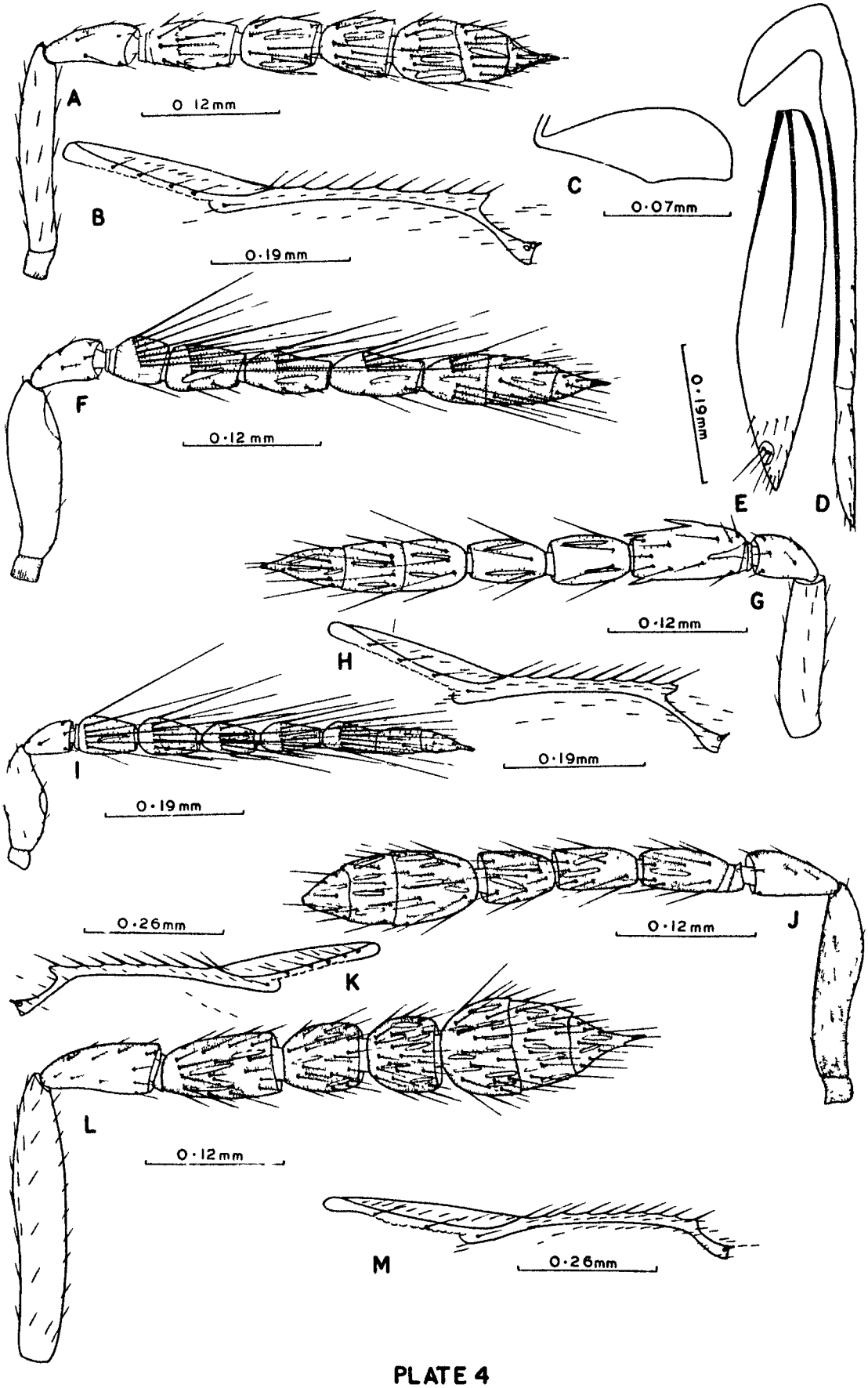
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PLATE 4

Tetrastichus metallicus sp.n.

(Plate 5, figs. A-J)

Female.

Resembles T. indicus sp.n. except in the following characters:

Head.- Dark with metallic reflections; eyes reddish brown; prominence between antennal sockets one-fourth the width of frons between eyes; malar space about as long as eye width; lower margin of clypeus with two dents medially.

Antennae (fig. B).- Brown except scape which is yellow; scape three and a half times as long as wide, as long as funicle; pedicel less than twice as long as wide, distinctly longer than first funicle segment; first funicle segment slightly longer than wide, second and third as long as wide; club slightly more than twice as long as wide.

Thorax.- Dark with metallic reflections; pronotum with posterior submarginal ridge bearing 4 pairs of setae, anterolateral angles abtuse and laterally directed (fig. C); scutum slightly longer than wide and with 7 setae near each parapsidal furrow; each parapside with 6 setae; scutellum more than one-half the length of scutum.

Fore wings.- Slightly more than twice as long as wide

(0.93:0.44 mm); costal cell with 7 setae; submarginal and marginal veins with 2 and 9 setae respectively (fig. E); disc with a line of setae running beneath the cubital hair line.

Legs.- Yellow except coxae which are dark with metallic reflections.

Abdomen.- Dark with metallic reflections; ovipositor arising from apical one-third of abdominal venter; third valvulae short, triangular, less than twice as long as wide, about one-fifth the length of second valvifers (fig. G); outer plates of ovipositor slightly longer than second valvifers and third valvulae together (fig. H); subgenital plate more or less of uniform width, posterior margin with a notch in middle (fig. I).

Female length: 1.13 mm.

Male.

Resembles T. indicus sp.n. except in the following characters:

Head.-Dark with metallic reflections; lower margin of clypeus with two dents medially. Antennae dark; flagellum with short hairs; scape slightly less than three times as long as wide, as long as basal two funicle segments together; pedicel as long as first funicle segment; first funicle segment shortest, slightly longer than wide, segments 2-4 subequal in length, each less than two times

as long as wide; club slightly more than four times as long as wide (fig. J). Thorax dark with metallic reflections. Legs dark except apices of femora, tibiae and tarsi which are yellow. Fore wings with submarginal and marginal veins with 2 and 9 setae respectively. Abdomen dark with metallic reflections; genitalia with gonobase slightly more than three times as long as wide, about as long as aedeagus; digitus short, twice as long as wide; aedeagal shaft long and blunt at apex (Plate 20, fig. H).

Male length: 1.57 mm.

Holotype ♀. INDIA: Uttar Pradesh, Aligarh University Agricultural Farm, ex Pulvinaria sp. on Azadirachta indica, 10.v.1977 (M. Younus Khan).

Paratypes 2 ♀ , 1 ♂ (Same data as holotype).

Tetrastichus ajmerensis sp.n.

(Plate 5, figs. K-S)

Female.

Resembles T. indicus sp.n. except in the following characters:

Head.- Eyes silvery white; prominence between antennal sockets one-sixth the width of frons between eyes; lower margin of

clypeus with two dents medially.

Antennae (fig. K).- Yellowish; scape three and a half times as long as wide (0.1:0.03 mm); pedicel one and a half times as long as wide; two ring segments distinct; funicle segments 1-3 slightly longer than wide, first shorter than second and third separately; club three times as long as wide (0.12:0.04 mm).

Thorax (fig. L).- Brownish; posterior margin of pronotum straight, posterior submarginal ridge distinct bearing 6 pairs of long setae (fig. M); scutellum about one-half the length of scutum; submedian grooves of scutellum widely separated.

Fore wings.- Costal cell slightly shorter than marginal vein and with 8 setae; submarginal and marginal veins with 3 and 8 setae respectively (fig. N); marginal fringe spaced by a distance equal to one-fifth their length.

Legs.- Yellowish except coxae and femora which are brown.

Abdomen.- Brownish except base which is yellow; third valvulae three and a half times as long as wide, one-third the length of second valvifers (fig. P); outer plates of ovipositor slightly longer than second valvifers (fig. Q); subgenital plate broad, posterior margin with a notch in middle (fig. R).

Female length: 0.91 mm.

PLATE 5

Figs. A-J. Tetrastichus metallicus sp. n.

A. Mandible, ♀

B. Antenna, ♀

C. Pronotum, ♀

D. Sculpture of scutum, ♀

E. Fore wing venation, ♀

F. First valvifer, ♀

G. Second valvifer and third valvula, ♀

H. Outer plate of ovipositor, ♀

I. Subgenital plate, ♀

J. Antenna, ♂

Figs. K-S. Tetrastichus ajmerensis sp. n.

K. Antenna, ♀

L. Propodeum and part of thorax in dorsal view, ♀

M. Pronotum, ♀

N. Fore wing venation, ♀

O. First valvifer, ♀

P. Second valvifer and third valvula, ♀

Q. Outer plate of ovipositor, ♀

R. Subgenital plate, ♀

S. Antenna, ♂

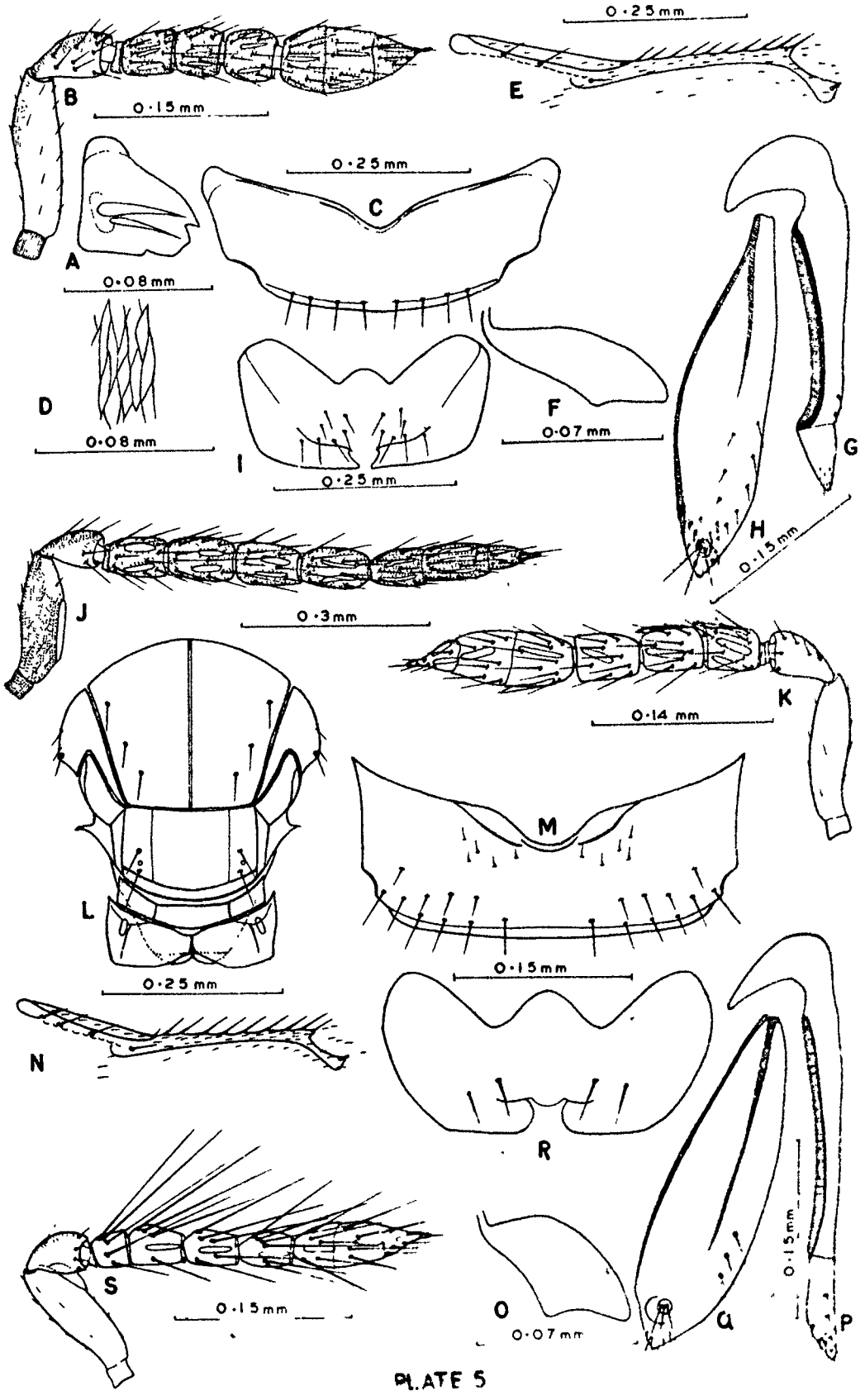
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PLATE 5

Male.

Resembles T. indicus sp. n. except in the following characters:

Head brown; eyes silvery white; lower margin of clypeus with two dents medially. Antennal scape three times as long as wide; funicle segments 2-4 subequal in length; club three times as long as wide (fig. S). Thorax dark brown. Fore wings twice as long as wide; costal cell shorter than marginal vein; submarginal and marginal veins with 3 and 8 setae respectively. Abdomen brown except base which is yellow; genitalia with gonobase uniformly broad, two and a half times as long as wide, as long as aedeagus, anterior margin of basal part rounded; digitus well developed, three times as long as wide; aedeagal shaft broad (Pl. 20, fig. I).

Male length: 0.9 mm.

Holotype ♀. INDIA: Rajasthan, Jaipur, ex Coccidohystrix insolitus (Green) on Solanum melongena Linn., 28.ix.1975 (M. Younus Khan).

Paratypes. 23 ♀, 10 ♂ (same data as holotype).

Tetrastichus annulicornis sp. n.

(Plate 6, figs. A-F)

Female.

Resembles T. indicus sp. n. except in the following

characters:

Head.- Yellowish except dorsum which is brown; antennae inserted just above lower level of eyes; prominence between antennal sockets one-fifth the width of frons between eyes; eyes deep red; lower margin of clypeus with two dents medially.

Antennae (fig. A).- Brownish except scape which is yellow; pedicel less than twice as long as wide, as long as first funicle segment; three ring segments distinct; first funicle segment one and a half times as long as wide, second and third slightly longer than wide.

Thorax.- Yellowish brown; scutum with 5 setae near each parapsidal furrow; scutellum slightly more than one-half the length of scutum.

Fore wings.- Twice as long as wide (0.74:0.37 mm); costal cell shorter than marginal vein and with 7 setae; submarginal and marginal veins with 4 and 10 setae respectively (fig. B); disc with a line of setae running beneath the cubital hair line.

Legs.- Yellow except fore coxae which are brown; middle tibial spur as long as basitarsus.

Abdomen.- Dark brown except basal one-third which is yellow; ovipositor arising from basal one-third of abdominal venter; first valvifers semicircular (fig. C); third valvulae six times as long as wide, more than one-third the length of second valvifers

(fig. D); outer plates of ovipositor as long as second valvifers (fig. E); subgenital plate broad, posterior margin with a notch in middle.

Female length: 1.07 mm.

Male.

Resembles T. indicus sp. n. except in the following characters:

Head brown; lower margin of clypeus with two dents medially. Antennal scape cylindrical, three and a half times as long as wide, as long as second and third funicle segments together; two ring segments distinct; second and fourth funicle segments subequal in length; third longest, twice as long as wide; club four times as long as wide, as long as preceding two funicle segments together (fig. F). Thorax brown; scutum with 4 setae near each parasidal furrow; posterior margin of pronotum with 5 pairs of setae. Fore wings with costal cell shorter than marginal vein; submarginal and marginal veins with 4 and 9 setae respectively. Abdomen brown except base which is yellow; genitalia with gonobase elliptical in shape, three times as long as wide, slightly longer than aedeagus; digitus short, slightly less than twice as long as wide; aedeagal shaft short and blunt (Pl. 20, fig. D).

Male length: 1.02 mm.

Holotype ♀. INDIA: Rajasthan, Jaipur, ex Coccidohystrix insolitus (Green) on Achyranthus aspera, 30.ix.1975 (M. Younus Khan).

Paratypes. 6 ♀, 6 ♂ (same data as holotype).

Tetrastichus flavus sp. n.

(Plate 6, figs. G-N)

Female.

Resembles T. indicus sp. n. except in the following characters:

Head.- Completely yellow; eyes red with 6 dark patches; antennae inserted above lower level of eyes; mandibles with well developed teeth (fig. G).

Antennae (fig. H).- Scape slightly less than four times as long as wide (0.18:0.05 mm), as long as basal two funicle segments together; pedicel less than twice as long as wide, shorter than first funicle segment; three ring segments distinct; funicle segments 1-3 subequal in length, each twice as long as wide; club three and a half times as long as wide, as long as preceding two funicle segments together.

Thorax.- Completely yellow; posterior margin of pronotum with 7 pairs of setae; scutum with 8 setae near each parapsidal furrow; scutellum slightly more than one-half the length of scutum;

propodeum very narrow in middle, posterior margin much sclerotized (fig. I).

Fore wings.- Slightly less than two and a half times as long as wide (1.38:0.58 mm); costal cell shorter than marginal vein and with 7 small setae; submarginal and marginal veins with 7 and 14 setae respectively; postmarginal vein rudimentary (fig. J); disc with a line of setae running beneath the cubital hairs line.

Legs.- Completely yellow; middle tibial spur as long as basitarsus.

Abdomen.- Completely yellow except apex of ovipositor infuscated; longer than head and thorax together (1.24:0.91 mm); ovipositor slightly exserted; first valvifers semicircular (fig. K); third valvulae four times as long as wide, one-fourth the length of second valvifers (fig. L); outer plates of ovipositor as long as second valvifers (fig. M).

Female length: 2.15 mm.

Male.

Resembles T. indicus sp. n. except in the following characters:

Head completely yellow, non metallic. Antennal scape flattened, two and a half times as long as wide, shorter than

basal two funicle segments together; pedicel as long as first funicle segment; first funicle segment slightly longer than wide; funicle segments third and fourth subequal in length, each three times as long as wide; club seven times as long as wide, slightly longer than preceding two funicle segments together (fig. N). Thorax completely yellow. Fore wings twice as long as wide; costal cell shorter than marginal vein; submarginal and marginal veins with 7 and 15 setae respectively; postmarginal vein rudimentary. Legs completely yellow. Abdomen yellow except apex of dorsum which is brownish; genitalia with gonobase broadened in middle, two and a half times as long as as wide, slightly longer than aedeagus, anterior margin of basal part triangular; digitus well developed, twice as long as wide; aedeagal shaft short and blunt (Pl. 20, fig. G).

Male length: 1.95 mm.

Holotype ♀. INDIA: Uttar Pradesh, Aligarh, Jawahar Park, ex Psyllids in leaf galls of Grewia asiatica Linn., 2.ix.1975 (M. Younus Khan).

Paratypes. 3 ♀, 2 ♂ (same data as holotype).

Tetrastichus flavidus sp. n.

(Plate 6, figs. O & P)

Female.

Resembles T. indicus sp.n. except in the following

characters:

Head.- Completely yellowish brown; antennae inserted just above lower level of eyes; prominence between antennal sockets about one-fourth the width of frons between eyes; eyes silvery white.

Antennae (fig. O).- Yellowish brown except scape which is yellow; scape slightly more than four times as long as wide (0.13:0.03 mm); three ring segments distinct; funicle segments 1-3 subequal in length, each one and a half times as long as wide.

Thorax.- Completely yellowish brown; scutum with 5 setae near each parapsidal furrow; scutellum more than one-half the length of scutum.

Fore wings.- More than twice as long as wide; costal cell shorter than marginal vein and with 11 setae; submarginal and marginal veins with 4 and 10 setae respectively; postmarginal vein slightly developed (fig. P); disc with a line of setae running beneath the cubital hair line.

Abdomen.- Yellow except 5 transverse bands on dorsum which are brown; longer than head and thorax together (0.89: 0.68 mm); ovipositor slightly exserted, arising from basal one-third of abdominal venter.

Female length: 1.57 mm.

PLATE 6

Figs. A-F. Tetrastichus annulicornis sp. n.

A. Antenna, ♀

B. Fore wing venation, ♀

C. First valvifer, ♀

D. Second valvifer and third valvula, ♀

E. Outer plate of ovipositor, ♀

F. Antenna, ♂

Figs. G-N. Tetrastichus flavus sp. n.

G. Mandible, ♀

H. Antenna, ♀

I. Metanotum and propodeum, ♀

J. Fore wing venation, ♀

K. First valvifer, ♀

L. Second valvifer and third valvula, ♀

M. Outer plate of ovipositor, ♀

N. Antenna, ♂

Figs. O & P. Tetrastichus flavidus sp. n.

O. Antenna, ♀

P. Fore wing venation, ♀

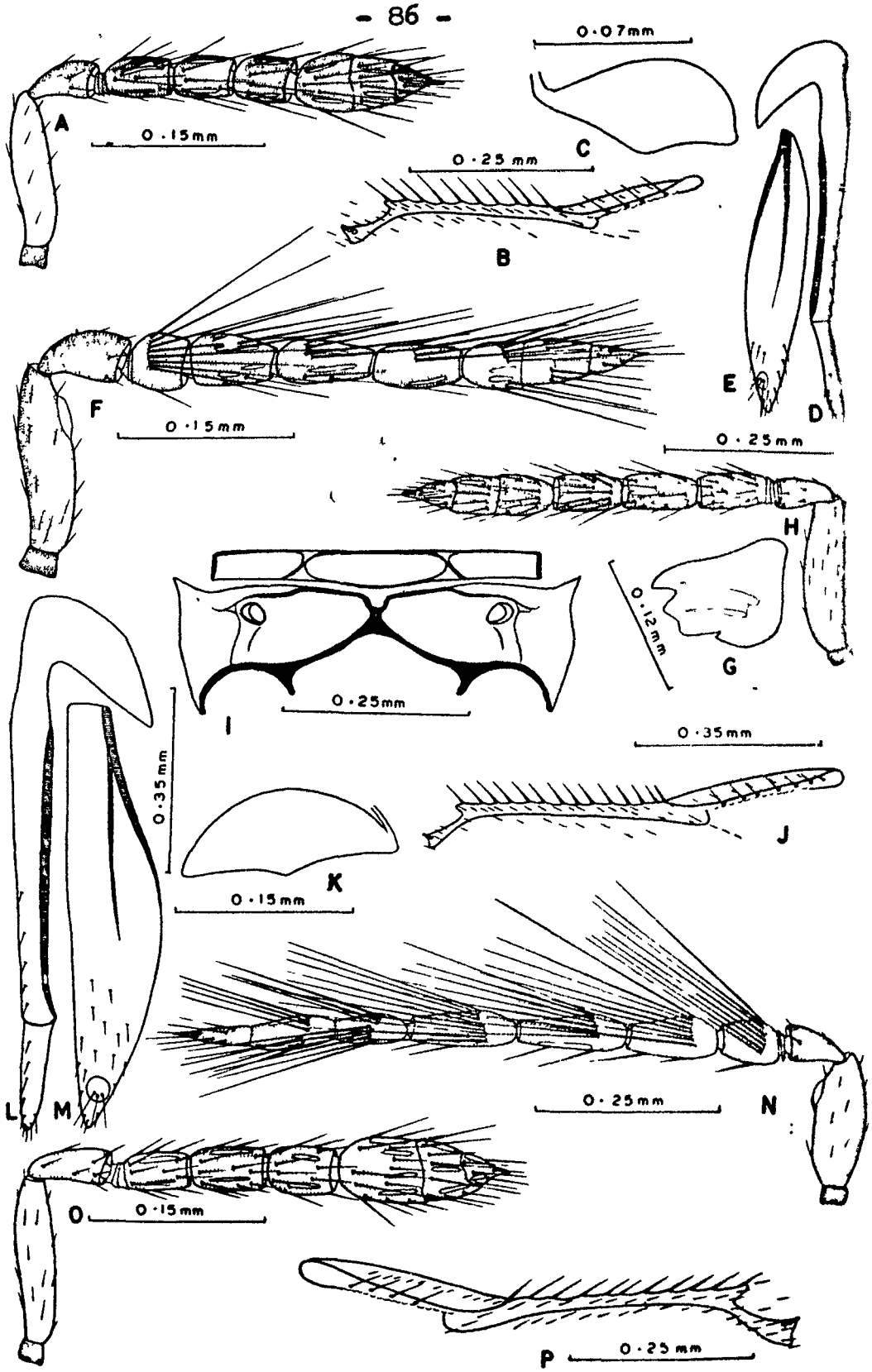
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PLATE 6

Holotype ♀. INDIA: Andhra Pradesh, Guntur, ex Coccid on Weed plant, 3. viii. 1976 (M. Younus Khan).

Paratype. 1♀ (Same data as holotype).

Tetrastichus longicorpus sp.n.

(Plate 7, figs. A-K)

Female.

Resembles T. indicus sp.n. except in the following characters:

Head.- Dark with metallic reflections; frontovertex much wider; ocelli arranged in strongly obtuse triangle; antennae inserted just above lower level of eyes; prominence between antennal sockets one-fourth the width of frons between eyes; eyes reddish brown; lower margin of clypeus with two dents medially.

Antennae (fig. C).- Brownish; scape slightly more than three times as long as wide (0.13:0.04 mm); distinctly longer than basal two funicle segments together; pedicel one and a half times as long as wide, as long as first funicle segment; funicle segments 1-3 subequal in length, each slightly longer than wide.

Thorax (fig. D).- Dark with metallic reflections; antero-lateral angles of pronotum diverging laterally (fig. E);

scutum with 2 setae near each parapsidal furrow; scutellum more than one-half the length of scutum.

Fore wings (fig. F).- Slightly less than two and a half times as long as wide; costal cell shorter than marginal vein and with 8 setae; marginal vein with 10 setae; postmarginal vein slightly developed; disc with a line of setae running beneath the cubital hair line.

Hind wings.- Seven times as long as wide; marginal fringe more than one-half the wing width, spaced by a distance equal to one-fifth their length.

Legs.- Dark brown except tibiae and basal two tarsal joints which are yellow; middle tibial spur shorter than basitarsus.

Abdomen (fig. G).- Dark with metallic reflections, longer than head and thorax together (0.81:0.68 mm); ovipositor much exserted; first valvifers semicircular (fig. H); third valvulae long, slightly less than one-half the length of second valvifers (fig. I); outer plates of ovipositor longer than second valvifers (fig. J); subgenital plate broad, posterior margin with a notch in middle (fig. K).

Female length: 1.49 mm.

Holotype ♀. INDIA: Uttar Pradesh, Aligarh, Sasni, ex Cerococcus hibisci Green on Hibiscus rosa-sinensis Linn., 10.x.1976 (M. Younus Khan).

Paratypes. 4♀ (same data as holotype)

Tetrastichus maculatus sp.n.

(Plate 7, figs. L-R)

Female.

Resembles T. indicus sp.n. except in the following characters:

Head.- Yellowish except occipital region which is dark; antennae inserted just above lower level of eyes; prominence between antennal sockets one-fourth the width of frons between eyes; lower margin of clypeus with two dents medially.

Antennae (fig. L).- Yellowish brown; pedicel one and a half times as long as wide; as long as first funicle segment; funicle segments 1-3 subequal in length, each slightly longer than wide; club three times as long as wide (0.19:0.06 mm); slightly shorter than funicle.

Thorax.- Brown except U-shaped band on scutum and scutellum completely which are yellow;posterior margin of pronotum semicircular (fig. M); scutum with 4 setae near each parapsidal furrow; scutellum more than one-half the length of scutum.

Fore wings.- Slightly more than twice as long as wide; costal cell with 6 setae; submarginal and marginal veins with 3 and

PLATE 7

Figs. A–K. Tetrastichus longicorpus sp. n.

A. Mandible, ♀

B. Maxillary and labial palpi, ♀

C. Antenna, ♀

D. Part of thorax in dorsal view, ♀

E. Pronotum, ♀

F. Fore wing, ♀

G. Abdomen in lateral view, ♀

H. First valvifer, ♀

I. Second valvifer and third valvula, ♀

J. Outer plate of ovipositor, ♀

K. Subgenital plate, ♀

Figs. L–R. Tetrastichus maculatus sp. n.

L. Antenna, ♀

M. Pronotum, ♀

N. Fore wing venation, ♀

O. First valvifer, ♀

P. Outer plate of ovipositor, ♀

Q. Second valvifer and third valvula, ♀

R. Subgenital plate, ♀

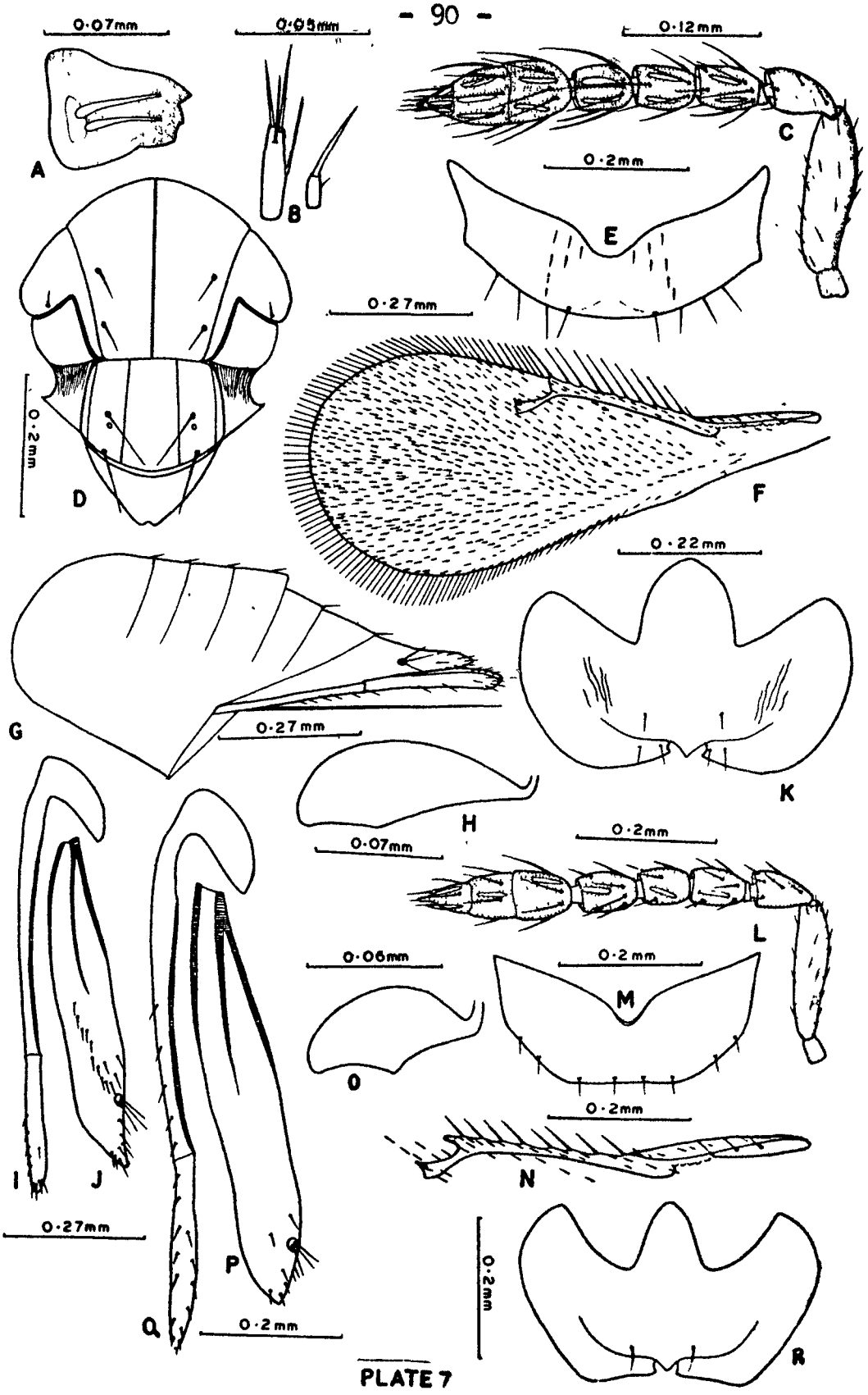
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PLATE 7

8 setae respectively; postmarginal vein well developed (fig. N); marginal fringe spaced by a distance equal to one-fifth their length; disc with a line of setae running beneath the cubital hair line.

Abdomen.- Yellowish except 5 transverse bands on dorsum which are dark; slightly longer than head and thorax together (0.71:0.61 mm); ovipositor exserted; first valvifers semicircular (fig. O); third valvulae seven times as long as wide, one-half the length of second valvifers (fig. Q); Outer plates of ovipositor longer than second valvifers (fig. P); subgenital plate broad, posterior margin with a notch in middle (fig. R).

Female length: 1.35 mm.

Holotype ♀. INDIA: Uttar Pradesh, Aligarh, Sasni, ex Ferrisia virgata (Cockerell) on Ficus glomerata, 10.vii.1977 (M. Younus Khan).

Paratypes: 3♀ (Same data as holotype).

Tetrastichus magnicorpus sp.n.

(Plate 8, figs. A-G)

Female.

Resembles T. indicus sp.n. except in the following characters:

Head.- Dark, sclerotized and with metallic reflections; face with scattered minute puncts; lateral ocelli by their own diameters from orbital margin; antennae inserted just above lower level of eyes; prominence between antennal sockets one-fifth the width of frons between eyes; mandibles with apical tooth well developed (fig. A); lower margin of clypeus with two dents medially.

Antennae (fig. B).- Brown except scape which is yellowish; scape five times as long as wide (0.25:0.05 mm), shorter than basal two funicle segments together; pedicel slightly less than twice as long as wide, one-half the length of first funicle segment; first funicle segment three times as long as wide, distinctly longer than second and third funicle segments separately, third twice as long as wide; club three times as long as wide (0.22: 0.07 mm); shorter than preceding two funicle segments together.

Thorax.- Dark, selerotized and with metallic reflections; scutum with 20 setae arranged in three rows near each parapsidal furrow.

Fore wings.- Slightly more than twice as long as wide; costal cell with 16 setae; submarginal and marginal veins with 5 and 14 setae respectively (fig. C); marginal fringe spaced by a distance equal to one-fifth their length; disc with a line of setae running beneath the cubital hair line.

Hind wings.- Four times as long as wide.

Legs.- Dark brown except tibiae and basal three tarsal segments which are yellow.

Abdomen.- Dark with metallic reflections, slightly longer than head and thorax together (1.35:1.24 mm); ovipositor exserted; first valvifers semicircular with basal and apical angles in one plane (fig. D); third valvulae long, eight times as long as wide, one-half the length of second valvifers (fig. E); outer plates of ovipositor slightly longer than second valvifers (fig. F); subgenital plate broad, posterior margin with a notch in middle, notch followed by laterally directed ridges (fig. G).

Female length: 2.59 mm.

Holotype ♀. INDIA: Uttar Pradesh, Aligarh, Sasni, ex Ferrisia virgata (Cockerell) on Ficus glomerata, 10.vii.1977. (M. Younus Khan).

Paratypes. 2♀ (same data as holotype).

PLATE 8

Figs. A-G. Tetrastichus magnicorpus sp.n.

A. Mandible, ♀

B. Antenna, ♀

C. Fore wing venation, ♀

D. First valvifer, ♀

E. Second valvifer and third valvula, ♀

F. Outer plate of ovipositor, ♀

G. Subgenital plate, ♀

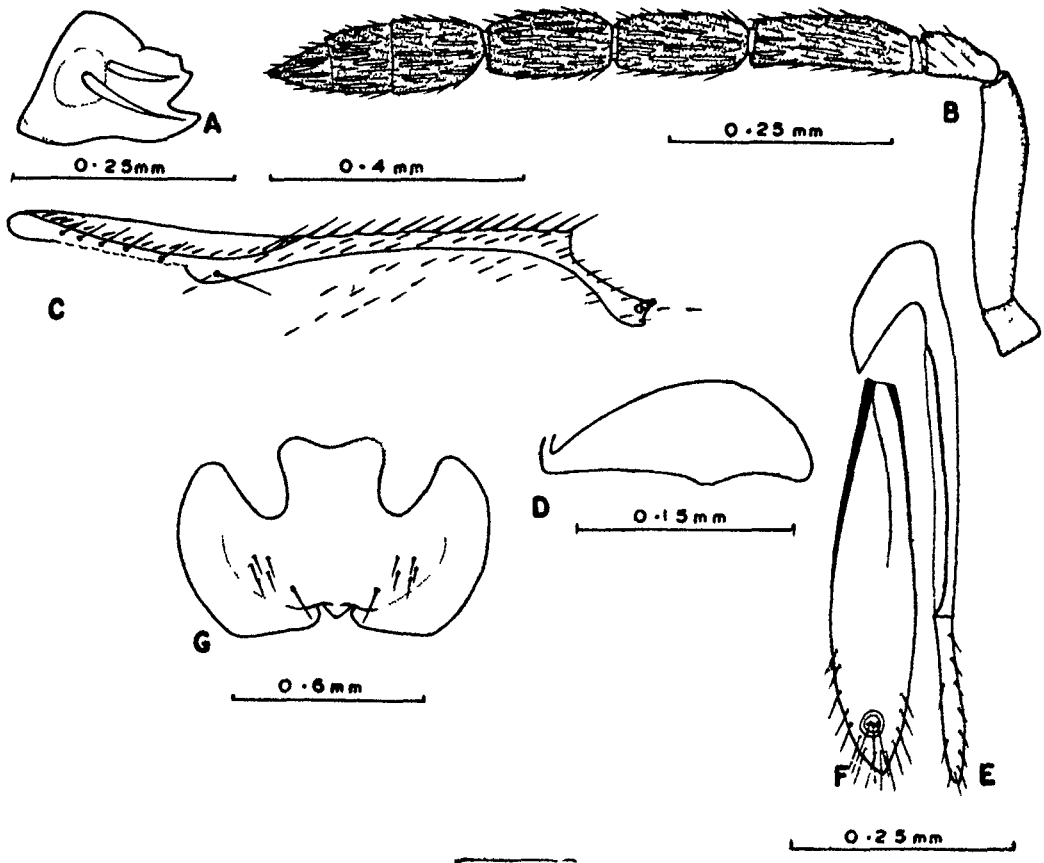

PLATE 8

2. Genus Syntomosphyrum Foerster

Syntomosphyrum Foerster, 1878, Verhandl. Naturhist. Ver. Preuss. Rheinl. u. Westfalens, 35: 60.

Type-species: Syntomosphyrum fulvipes Foerster (Monobasic).

The genus Syntomosphyrum was proposed by Foerster (1878) for the species S. fulvipes Foerster. Muesebeck et al. (1951) declared the genus Tetrastichopsis Girault to be a synonym of Syntomosphyrum Foerster. Recently, the genus Syntomosphyrum Foerster was synonymized with Aprostocetus Westwood by Graham (1961) and with Tetrastichus Haliday by Domenichini (1965). However, Waterston (1915a&b), Ferrière (1933, 1940b), Muesebeck et al. (1951), Kurian (1954), Burks (1952, 1967), Risbec (1957), Peck (1963) and Peck et al. (1964) recognized Syntomosphyrum as valid genus. They separated it from its closely allied genera for absence of longitudinal grooves on scutum and scutellum. The present writer followed earlier workers in treating Syntomosphyrum as a valid genus. This will gets support from Kerrich's (1969) in which Platocharis Kerrich and Schizocharis Kerrich separated on the basis of presence or absence of scutellar grooves. Some new generic characters are suggested viz. Pronotum with anterior margin deeply concave, posterior margin straight or slightly curved (Pl. 9, fig. F; Pl. 10, fig. C; Pl. 11, fig. F; Pl. 12, fig. D); third valvulae movably articulated with second valvifers (Pl. 9, fig. H; Pl. 10, fig. F; Pl. 11, fig. I; Pl. 12, fig. H);

posterior margin of subgenital plate with a notch in middle (Pl. 9, fig. J; Pl. 11, fig. K; Pl. 12, fig. J); male genitalia with gonobase longer than aedeagus, digitus short each with single projection (Pl. 11, fig. N).

Key to some Oriental species of Syntomosphyrum Foerster, based on females

1. Funicle segments subquadrate or longer than wide. . . .2
__ Funicle segments transverse; first funicle segment with two sensoria, bristle to spur of club as long as, or longer than the last club joint. . .S. indicum Silvestri
2. Pedicel longer than first funicle segment. 3
__ Pedicel as long as or shorter than first funicle segment 5
3. Abdomen shorter than head and thorax together; antennae with 1 or 2 ring segments; vertex smooth. 4
__ Abdomen as long as head and thorax together; antennae with 3 ring segments; vertex finely punctate; body orange yellow. . . . . S. obscuriceps Ferrière
4. Scutum densely setose; pedicel two and a half times as long as wide; antennae with 2 ring segments; club not longer than preceding two funicle segments together. . . . . .S. javanicum Ferrière
__ Scutum with 3 setae near each parapsidal furrow; pedicel

one and a half times as long as wide; antennae with 1 ring segment; club distinctly longer than preceding two funicle segments together; pronotum with posterior submarginal ridge bearing 5 pairs of setae (Pl. 9, fig. F); first valvifers triangular with basal and apical angles at different levels (Pl. 9, fig. G); anterior margin of basal part of second valvifers not much curved; third valvulae short and blunt, two and a half times as long as wide, less than one-half the length of second valvifers (Pl. 9, fig. H); outer plates of ovipositor broad, twice as long as wide with thickened dorsal margin, apex broadly truncated (Pl. 9, fig. I). . . . . S. cerococci sp. n.

5. Pedicel as long as first funicle segment; first funicle segment slightly longer than wide; thorax dark brown. .6

— Pedicel shorter than first funicle segment; first funicle segment more than one and a half times as long as wide; thorax brown or yellow, non metallic; pronotum broad, antero-lateral angles acute, posterior margin straight, lateral margins of each side with a small protuberance, posterior submarginal ridge absent (Pl. 11, fig. F; Pl. 12, fig. D); third valvulae 5-6 times as long as wide, less than one-half the length of second valvifers (Pl. 11, fig. I; Pl. 12, fig. H). . . 7

6. Antennae with 2 ring segments; first funicle segment as long as wide, shorter than second, third as long as second; pedicel one-third the length of scape; submarginal vein with 2 setae; disc of fore wings with coarse setae; venation dark. . . . . .S. taprobanes Waterston

__ Antennae with 1 ring segment; first funicle segment distinctly longer than wide, as long as second, third longest; pedicel more than one-third the length of scape; submarginal vein with 1 seta; disc of fore wings with hyaline setae; venation yellow; pronotum with posterior margin slightly curved, posterior submarginal ridge distinct bearing 3 pairs of long setae (Pl. 10, fig. C); first valvifers triangular with basal and apical angles at different levels (Pl. 10, fig. E); third valvulae five times as long as wide, less than one-half the length of second valvifers (Pl. 10, fig. F). . . . . S. mashhoodi sp. n.

7. Thorax brown; scutum with 16 longitudinal ridges anteriorly and with a row of 4 setae near each parapsidal furrow (Pl. 11, fig. E); first funicle segment less than twice as long as wide, second and third each slightly longer than wide; club much longer than preceding two funicle segments together; submarginal vein with 3 setae; first valvifers with basal and apical

angles at different levels (Pl. 11, fig. H). . . . . .
. . . . . S. udaipurensis sp. n.

— Thorax yellow; scutum with 4 or 5 longitudinal ridges anteriorly and with 8 setae irregularly arranged near each parapsidal furrow (Pl. 12, fig. C); first funicle segment more than twice as long as wide, second and third each twice as long as wide; club as long as preceding two funicle segments together; submarginal vein with 4 setae; first valvifers almost semicircular with basal and apical angles in one plane (Pl. 12, fig. G). .
. . . . . S. anomalococci sp. n.

Syntomosphyrum cerococci sp. n.

(Plate 9, figs. A-J)

Female (fig. A).

Head (fig. B).- Dark with metallic reflections, wider than long in facial view (0.42:0.34 mm); frontovertex smooth, width more than one-half the total head width; scrobes deep and convergent above; ocelli white, arranged in obtuse triangle, lateral ocelli by their own diameters from orbital margin; antennae inserted just below lower level of eyes; prominence between antennal sockets one-fourth the width of frons between eyes; malar space longer than eye width; malar sutures distinct; eyes reddish brown; mandibles tridentate with apical tooth acute,

mesal rounded lower rudimentary (fig. C); maxillary and labial palpi each 1-segmented (fig. D); lower margin of clypeus with two dents medially (fig. B).

Antennae (fig. E).- Brown except scape which is yellowish brown; 8-segmented excluding 1 ring segment; scape cylindrical, four times as long as wide (0.16:0.04 mm), as long as funicle; pedicel one and a half times as long as wide, longer than first funicle segment; funicle 3-segmented, first slightly longer than wide, second and third each as long as wide; club 3-segmented, about twice as long as wide (0.13:0.06 mm), longer than preceding two funicle segments together.

Thorax.- Dark with metallic reflections; posterior margin of pronotum with submarginal ridge bearing 5 pairs of setae (fig. F); parapsidal furrows well developed; scutum with 3 setae near each parapsidal furrow and without mid longitudinal groove; scutellum with 4 setae and without submedian grooves; propodeum with a well developed median carina.

Fore wings.- Hyaline, slightly more than twice as long as wide (1.13:0.5 mm); disc with hyaline setae, broadly rounded at apex; costal cell longer than marginal vein and with 4 small setae; submarginal vein with 1 long seta directing apically and 3 small setae directing backward; marginal vein with 9 setae; postmarginal vein absent; marginal fringe short, spaced

by a distance equal to one-third their length.

Hind wings.- Hyaline, five times as long as wide (1.1:0.22 mm), narrow at apex; disc with hyaline setae; marginal fringe spaced by a distance equal to one-fourth their length.

Legs.- Yellowish brown except coxae and femora which are dark brown; tarsi 4-jointed; middle tibial spur shorter than basitarsus.

Abdomen.- Dark brown and petiolate, shorter than head and thorax together; ovipositor concealed, arising from apical one-third of abdominal venter; first valvifers triangular with basal and apical angles at different levels (fig. G); anterior margin of basal part of second valvifers not much curved, third valvulae short and blunt, two and a half times as long as wide, less than one-half the length of second valvifers (fig. H); outer plates of ovipositor broad, twice as long as wide with thickened dorsal margin, apex broadly truncated (fig. I); subgenital plate short and of uniform width, posterior margin with a small semicircular notch in middle (fig. J).

Female length: 1.38 mm.

Holotype ♀. INDIA: Karnatka, Bangalore City, ex Ceroococcus hibisci Green on Hibiscus rosa-sinensis Linn., 4.viii.1976 (M. Younus Khan).

Paratypes. 4 ♀ (same data as holotype).

PLATE 9

Figs. A-J. Syntomosphyrum cerococci sp. n.

A. Entire body, ♀

B. Head in facial view, ♀

C. Mandible, ♀

D. Maxillary and labial palpi, ♀

E. Antenna, ♀

F. Pronotum, ♀

G. First valvifer, ♀

H. Second valvifer and third valvula, ♀

I. Outer plate of ovipositor, ♀

J. Subgenital plate, ♀

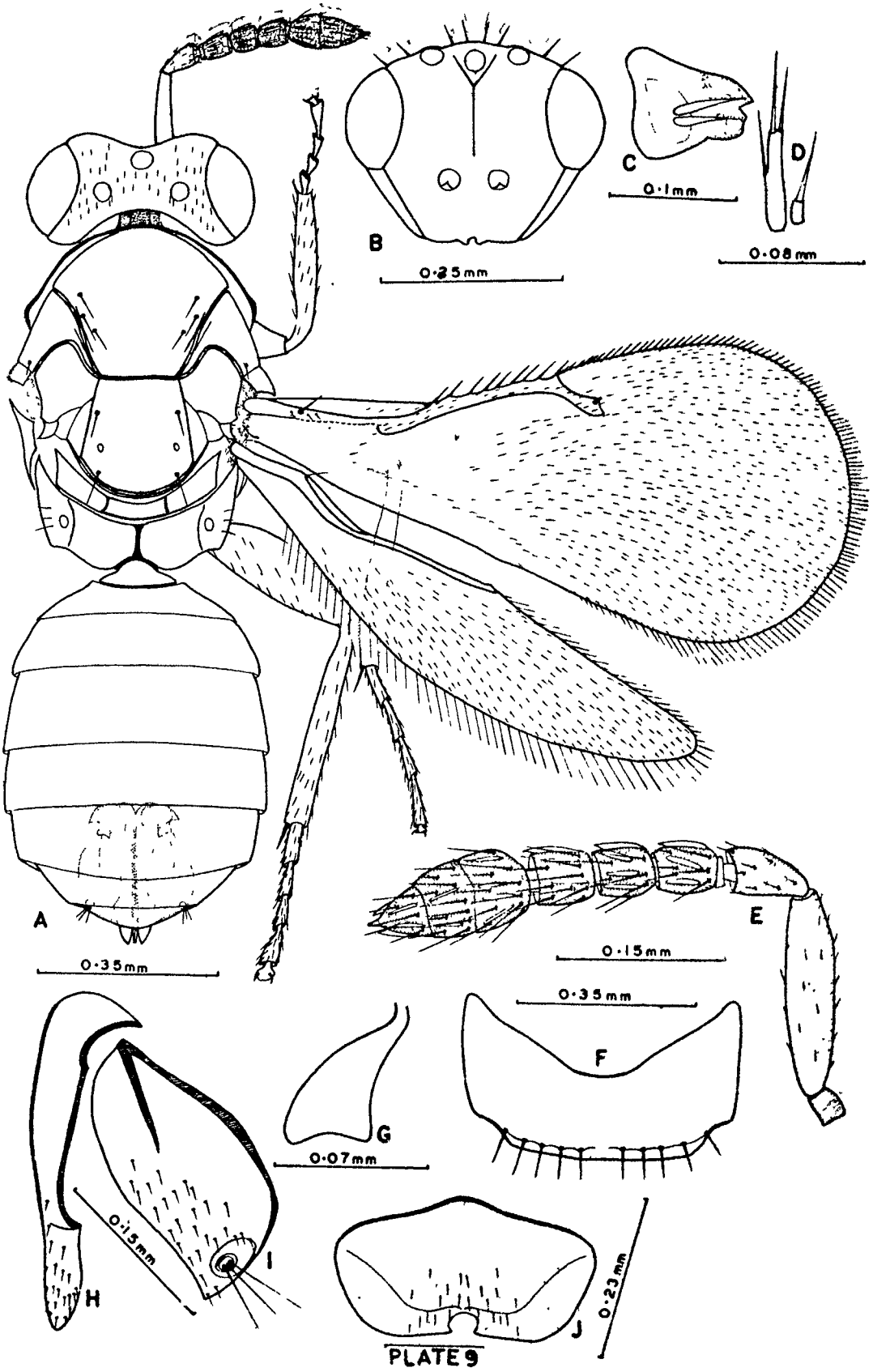
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PLATE 9

Syntomosphyrum mashhoodi sp. n.

(Plate 10, figs. A-G)

Female.

Head.- Yellowish brown, wider than long in facial view; frontovertex width more than one-half the total head width; ocelli white, arranged in obtuse triangle, lateral ocelli twice their own diameters from orbital margin and close to occipital margin; eyes red and smooth; antennae inserted at lower level of eyes; prominence between antennal sockets one-third the width of frons between eyes; malar space longer than eye width; malar sutures distinct; mandibles with apical tooth acute (fig. A); maxillary and labial palpi each 1-segmented.

Antennae (fig. B).- Yellow, 8-segmented excluding 1 ring segment; scape cylindrical, three and a half times as long as wide; pedicel one and a half times as long as wide, as long as first funicle segment; funicle 3-segmented, first and second segments subequal in length, each slightly longer than wide, third longest, more than one and a half times as long as wide; club 3-segmented, three times as long as wide (0.16:0.05 mm), slightly shorter than funicle.

Thorax.- Dark brown; pronotum with posterior margin slightly curved, posterior submarginal ridge distinct bearing 3 pairs of setae (fig. C); parapsidal furrows complete; scutum

with 2 setae near each parapsidal furrow and without median groove; scutellum wider than long with 2 pairs of setae and without submedian grooves; propodeum with a median carina.

Fore wings.- Hyaline, more than twice as long as wide (1.2:0.53 mm), broadly rounded at apex; disc with hyaline setae; costal cell slightly longer than marginal vein and with 11 small setae; submarginal and marginal veins with 1 and 8 setae respectively (fig. D); marginal fringe short, spaced by a distance equal to one-half their length.

Hind wings.- Hyaline, five times as long as wide (0.96: 0.19 mm), disc with hyaline setae; marginal fringe short, spaced by a distance equal to one-half their length.

Legs.- Yellow except coxae and femora which are brown; tarsi 4-jointed; middle tibial spur shorter than basitarsus.

Abdomen.- Brown, petiolate, about as long as head and thorax together; ovipositor concealed, arising from mid of abdominal venter; first valvifers triangular with basal and apical angles at different levels (fig. E); anterior margin of basal part of second valvifers much curved, third valvulae six times as long as wide, less than one-half the length of second valvifers (fig. F); outer plates of ovipositor slightly shorter than second valvifers and third valvulae together (fig. G).

PLATE 10

Figs. A-G. *Syntomosphyrum mashhoodi* sp. n.

A. Mandible, ♀

B. Antenna, ♀

C. Pronotum, ♀

D. Fore wing venation, ♀

E. First valvifer , ♀

F. Second valvifer and third valvula, ♀

G. Outer plate of ovipositor, ♀

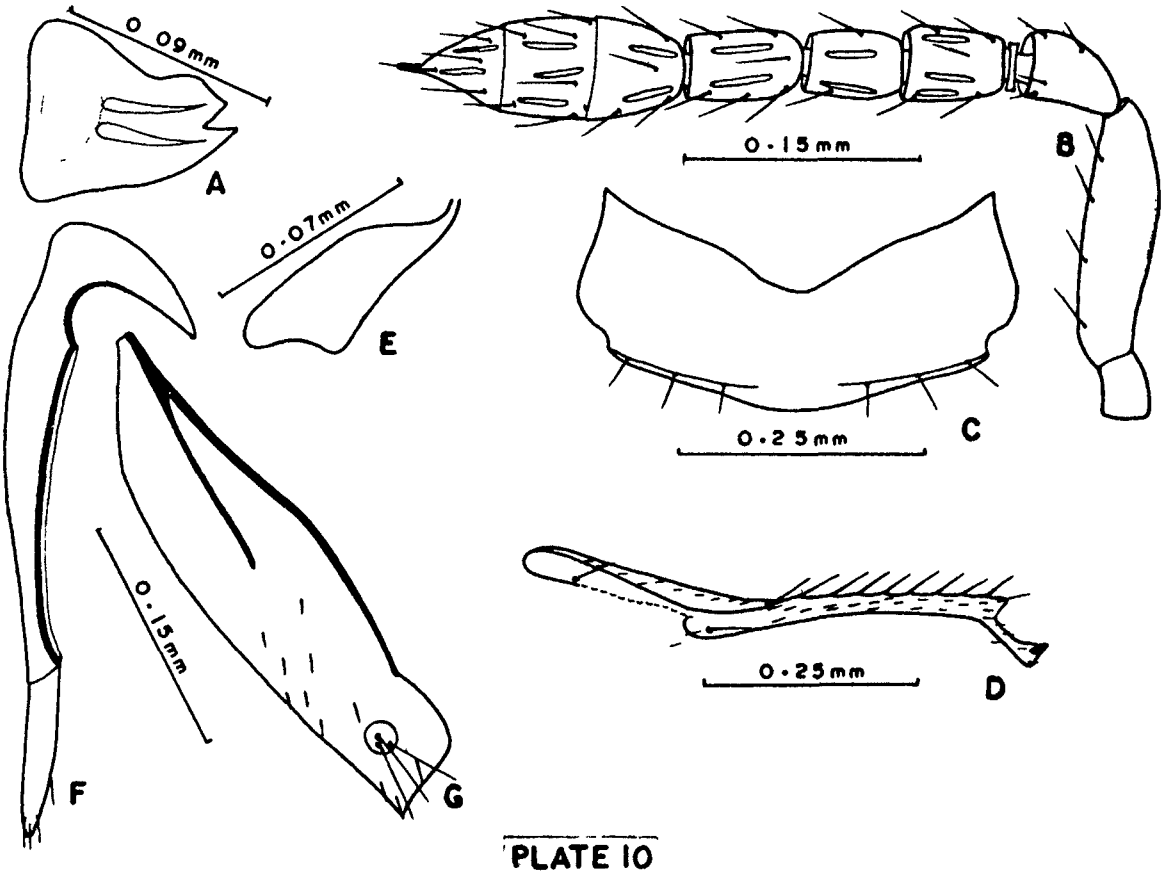


PLATE 10

Female length: 1.2 mm.

Holotype ♀. INDIA: Uttar Pradesh, Aligarh, University Campus, ex Coccinellid larvae on Aphids on Solanum melongena Linn., 10.viii.1977 (M. Younus Khan).

Paratypes. 2 ♀ (same data as holotype).

This species is named for Prof. S. Mashhood Alam, in recognition of his contributions to our knowledge of the Chalcidoidea.

Syntomosphyrum udaipurensis sp. n.

(Plate 11, figs. A-N)

Female.

Head (fig. A).- Brown, wider than long in facial view; frontovertex width more than one-half the total head width; ocelli yellowish, arranged in obtuse triangle, lateral ocelli slightly more than their own diameters from orbital and less than their own diameters from occipital margins; eyes red and smooth; malar space longer than eye width; malar sutures distinct; antennae inserted above lower level of eyes; prominence between antennal sockets about one-fourth the width of frons between eyes; mandibles tridentate with apical tooth long and acute mesal small and acute, lower rudimentary (fig. B); maxillary and labial palpi each 1-segmented (fig. D).

Antennae (fig. C).- Brownish, except scape and apical half of pedicel which are yellow; 8-segmented excluding 2 ring segments; scape cylindrical, slightly more than three times as long as wide (0.10:0.03 mm); pedicel one and a half times as long as wide, shorter than first funicle segment; funicle 3-segmented; segments 1-3 gradually decreasing in length distad; first funicle segment longest, more than one and a half times as long as wide, second and third slightly longer than wide; club 3-segmented, much longer than preceding two funicle segments together.

Thorax (fig. E).- Brown; pronotum broad, antero-lateral angles acute, posterior margin straight, lateral margin of each side with a small protuberance, posterior submarginal ridge absent (fig. F); scutum slightly wider than long with 16 longitudinal ridges anteriorly and a row of 4 setae near each parapsidal furrow; each parapside with single seta; scutellum wider than long and with two pairs of setae; scutum and scutellum without longitudinal grooves; propodeum with a median carina diverging backwards.

Fore wings (fig. G).- Hyaline, slightly more than twice as long as wide (0.85:0.4 mm); costal cell long and narrow, slightly shorter than marginal vein and with 8 small setae; submarginal and marginal veins with 3 and 11 setae respectively;

postmarginal vein rudimentary; marginal fringe short, spaced by a distance equal to one-fourth their length.

Hind wings.- Hyaline, four times as long as wide; marginal fringe spaced by a distance equal to one-fourth their length.

Legs.- Yellow; tarsi 4-jointed; mid tibial spur shorter than basitarsus.

Abdomen.- Dark brown except base which is yellow, as long as head and thorax together; ovipositor slightly exserted, arising from near base of abdominal venter; first valvifers semicircular with basal and apical angles at different levels (fig. H); third valvulae five times as long as wide, slightly less than one-half the length of second valvifers (fig. I); outer plates of ovipositor long and of uniform width (fig. J); subgenital plate with anterior margin slightly concave, posterior margin semicircular with a notch in middle (fig. K).

Female length: 1.07 mm.

Male.

Resembles female except in the following characters:

Body yellowish brown; antennae (fig. M) 9-segmented; scape slightly flattened, two and a half times as long as wide; pedicel slightly longer than wide, longer than first funicle

PLATE 11

Figs. A-N. Syntomosphyrum udaipurensis sp. n.

A. Head in facial view, ♀

B. Mandible, ♀

C. Antenna, ♀

D. Maxillary and labial palpi, ♀

E. Propodeum and part of thorax in dorsal view, ♀

F. Pronotum, ♀

G. Fore wing, ♀

H. First valvifer, ♀

I. Second valvifer and third valvula, ♀

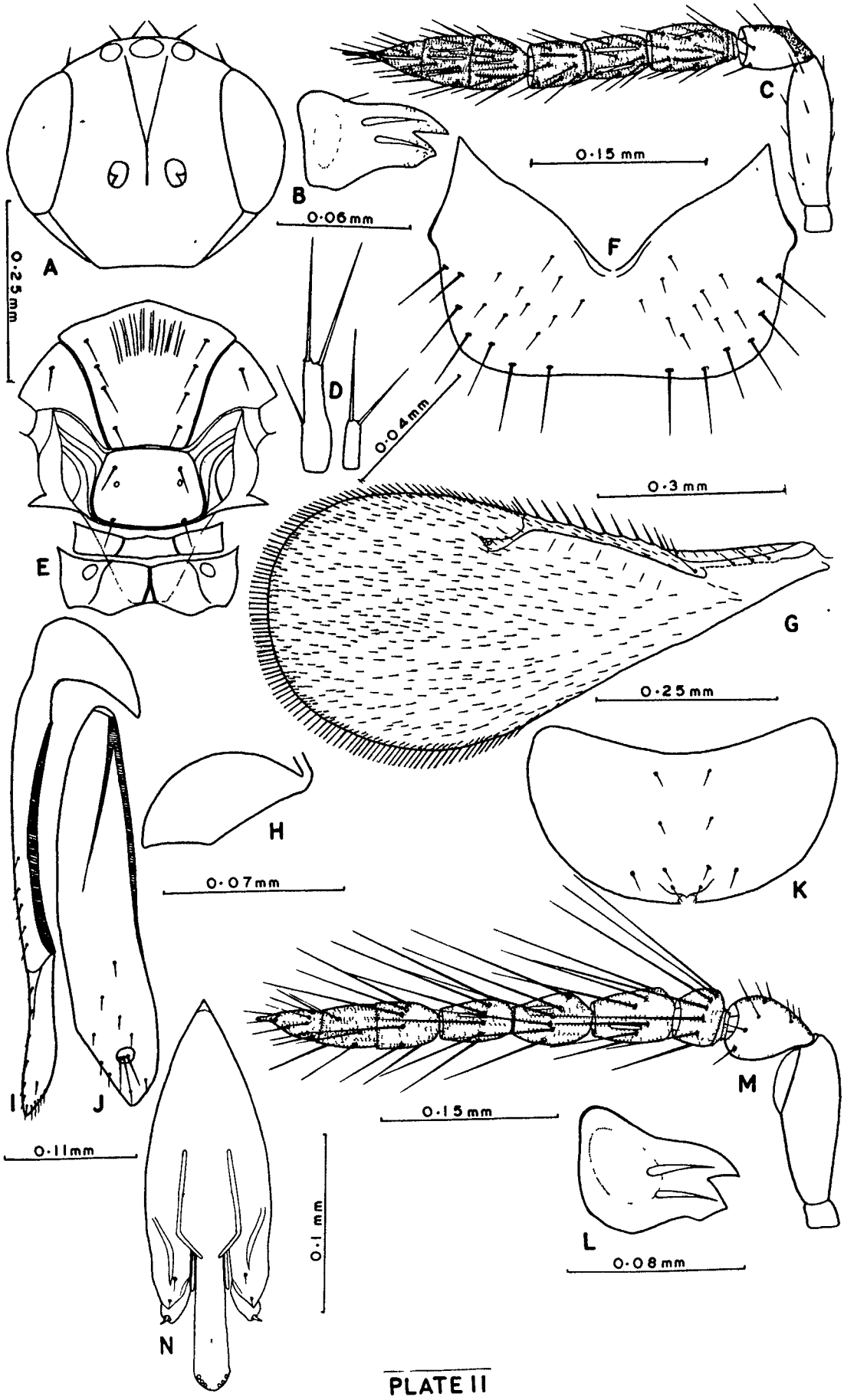
J. Outer plate of ovipositor, ♀

K. Subgenital plate, ♀

L. Mandible, ♂

M. Antenna, ♂

N. Genitalia, ♂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E
F
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G
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H
0·07 mm
I
J
0·11 mm
K
0·15 mm
L
0·08 mm
M
N
0·1 mm

PLATE II

segment; funicle 4-segmented, each segment with a whorl of long hairs; first funicle segment slightly wider than long, one-half the length of second segment, segments 2-4 subequal in length, each distinctly longer than wide; club four times as long as wide; male genitalia with gonobase two and a half times as long as wide, longer than aedeagus, anterior margin of basal part much acute, digitus with a small projection, aedeagal shaft long (fig. N).

Male length: 0.96 mm.

Holotype ♀. INDIA: Orissa, Bhubaneswar, ex eggs of Fulgorid on Ficus sp., 4.ix.1975 (M. Younus Khan).

Paratypes. 4 ♀, 3 ♂ (same data as holotype); 10 ♀, Rajasthan, Udaipur, ex eggs of Pyrilla sp. on Saccharum officinarum Linn., 10.viii.1977 (M. Younus Khan).

Syntomosphyrum anomalococci sp.n.

(Plate 12, figs. A-J)

Female.

Head.- Yellowish except ocellar and postococipital regions which are dark brown, slightly wider than long in facial view (0.44:0.4 mm); frontovertex slightly wider than long, width slightly less than one-half the total head width; ocelli white, arranged in equilateral triangle, lateral ocelli less than their

own diameters from orbital and occipital margins separately; eyes red and smooth; antennae inserted above lower level of eyes; prominence between antennal sockets one-third the width of frons between eyes; malar sutures distinct; malar space shorter than eye width; mandibles tridentate with apical tooth long and acute (fig. A); maxillary and labial palpi each 1-segmented.

Antennae (fig. B).- Yellowish brown except scape which is yellow, 8-segmented excluding 2 ring segments; scape slightly flattened, slightly more than two and a half times as long as wide (0.13:0.05 mm); pedicel one and a half times as long as wide, shorter than first funicle segment; funicle 3-segmented, segments 1-3 gradually decreasing in length distad; first funicle segment slightly more than twice as long as wide, second and third each twice as long as wide; club 3-segmented, slightly less than four times as long as wide, as long as preceding two funicle segments together.

Thorax (fig. C).- Yellow; pronotum broad with an infuscated patch in middle, antero-lateral angles acute, lateral margins of each side with small protuberance, posterior margin straight, posterior submarginal ridge absent (fig. D); scutum slightly longer than wide, bearing 5 longitudinal ridges anteriorly and 8 irregularly arranged setae near each parapsidal furrow; each parapside with 7 setae; scutum and scutellum with-

out longitudinal grooves; scutellum with 2 pairs of setae; propodeum with a median carina diverging backward.

Fore wings (fig. E).- Hyaline, about twice as long as wide; costal cell shorter than marginal vein; submarginal and marginal veins with 4 and 11 setae respectively (fig. F); marginal fringe short, spaced by a distance equal to one-third their length.

Hind wings.- More than four times as long as wide; marginal fringe spaced by a distance equal to one-third their length.

Legs.- Yellowish; mid tibial spur shorter than basitarsus.

Abdomen.- Yellow except dorsum with transverse brown bands, longer than thorax; ovipositor slightly exserted, arising from near base of abdominal venter; first valvifers almost semicircular with basal and apical angles in one plane (fig. G); third valvulae long, six times as long as wide, less than one-half the length of second valvifers (fig. H); outer plates of ovipositor long and of uniform width (fig. I); subgenital plate of uniform width, anterior margin slightly concave, posterior margin semicircular with a notch in middle (fig. J).

Female length: 1.4 mm.

Holotype ♀. INDIA: Tamil Nadu, Vellore, ex Anomalococcus crematogastri Green on Acacia sp., 4.i.1976 (M. Younus Khan).

Paratypes. 15 ♀ (same data as holotype).

PLATE 12

Figs. A–J. *Syntomosphyrum anomalococci* sp. n.

A. Mandible, ♀

B. Antenna, ♀

C. Propodeum and part of thorax in dorsal view, ♀

D. Pronotum, ♀

E. Basal part of fore wing, ♀

F. Fore wing venation, ♀

G. First valvifer, ♀

H. Second valvifer and third valvula, ♀

I. Outer plate of ovipositor, ♀

J. Subgenital plate, ♀

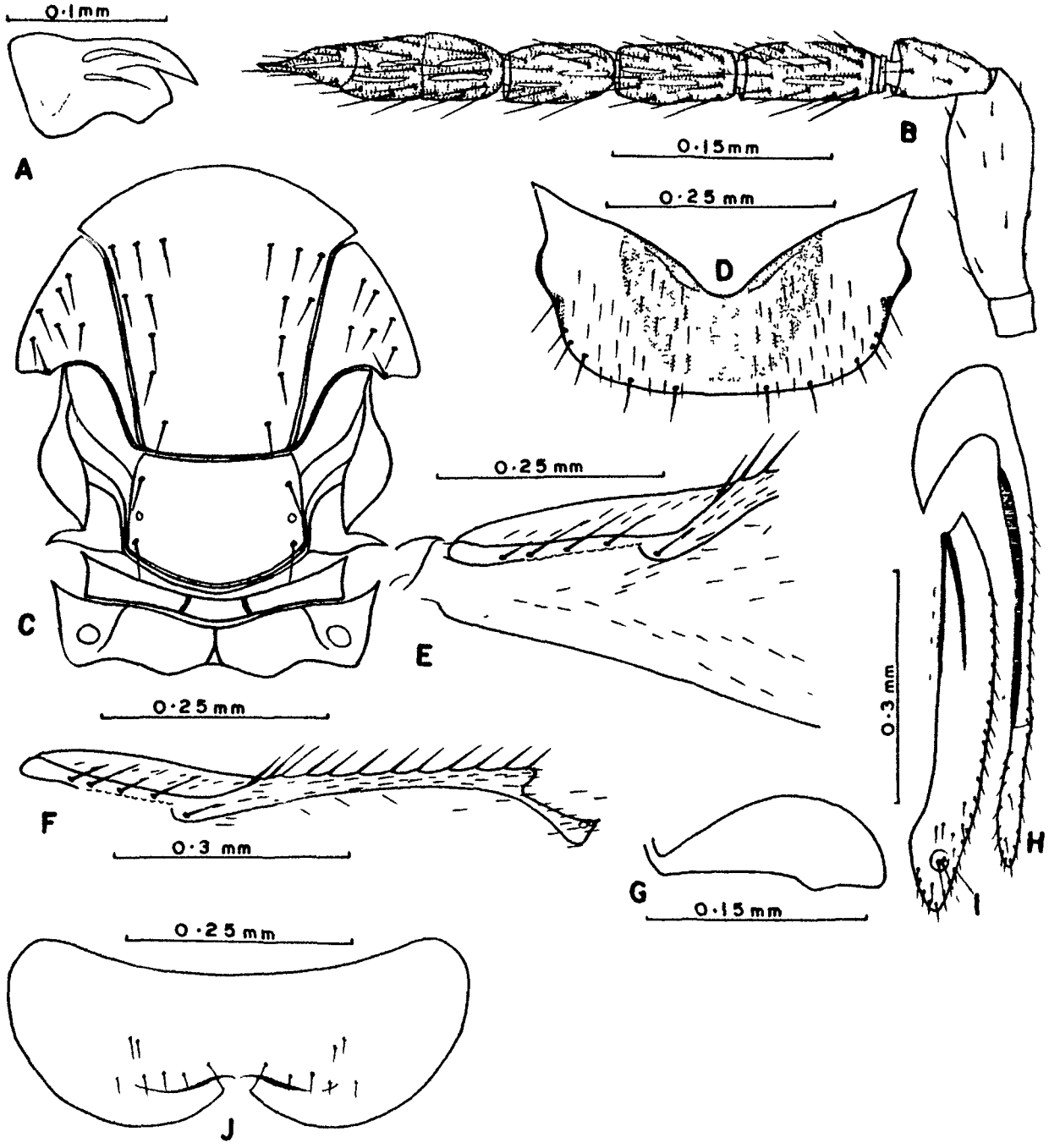

0·1mm
A
B
0·15mm
0·25 mm
D
C
0·25 mm
E
0·25 mm
F
0·3 mm
0·3 mm
G
0·15mm
H
I
0·25 mm
J

PLATE 12

SUBFAMILY: ELACHERTINAE ASHMEAD

KEY TO SOME GENERA OF THE SUBFAMILY ELACHERTINAE, BASED ON FEMALES

1. Hind tibia with two very long spurs, inner spur longer than basitarsus (Pl. 14, fig. J; Peck et al., 1964, fig. 215); thorax with very long setae. 2

__ Hind tibia usually with one small spur, shorter than basitarsus (Pl. 13, fig. N). 3

2. Scutellum with two sublateral longitudinal grooves (Erdös, 1966, fig. 1). . . . . .Euplectromorpha Girault

__ Scutellum without sublateral longitudinal grooves (Peck et al., 1964, fig. 214); pronotum with anterior margin deeply concave, antero-lateral arms long and narrow (Pl. 14, fig. D); first valvifers triangular with basal and apical angles at different levels (Pl. 14, fig. K); second valvifers of uniform width, third valvulae rudimentary, articulated with second valvifers (Pl. 14, fig. L); outer plates of ovipositor narrow at base, broadened at apex (Pl. 14, fig. M); subgenital plate of uniform width, anterior margin straight, posterior margin with a wide notch in middle (Pl. 14, fig. N). . . . . .Euplectrus Westwood

3. Funicle 2-segmented; club 3-segmented; scutellum without submedian grooves. 4

__ Funicle 4-segmented. 5

4. Fore wings with two tufts of black setae one beneath sub-

marginal vein and other beneath marginal vein; maxillary and labial palpi 2 and 1-segmented respectively; propodeum with median carinae; postmarginal vein undeveloped; abdomen rounded and petiolate. . . . . .Trichospilus Ferriere

__ Fore wings without tufts of black setae beneath submarginal and marginal veins; maxillary and labial palpi each 1-segmented; propodeum without median carinae; postmarginal vein well developed; abdomen elongate not petiolate; pronotum of uniform width (Pl. 13, fig. E); first valvifers semicircular with basal and apical angles at different levels (Pl. 13, fig. H); third valvulae blunt, movably articulated with second valvifers (Pl. 13, fig. I); outer plates of ovipositor long, slightly shorter than second valvifers, with a mid-longitudinal ridge (Pl. 13, fig. J); subgenital plate with anterior margin straight, posterior margin with a semicircular notch in middle, postero-lateral ridges present (Pl. 13, fig. K). . . . . .Scotolinx Ashmead

5. Median carinae of propodeum well separated, bowed inwards and joined by a strong transverse carina; scutellum with a pair of sublateral grooves which run the whole length, then bend inward to join before the apical margin; occipital margin strongly raised; hind tibia with single spur. . . . . .Stenomesius Westwood

__ Median carinae of propodeum running very close together; scutellum with a pair of sublateral grooves developed anteriorly; occipital margin immarginate; hind tibia with two spurs. . . . . .Miotropis Thomson

3. Genus Scotolinx Ashmead

Scotolinx Ashmead, 1904, Mem. Carnegie Mus., 1: 354.

Type-species: Scotolinx gallicola Ashmead.

The genus Scotolinx was proposed by Ashmead (1904a) for the species Scotolinx gallicola Ashmead. The distinguishing characters of this genus have been given by Ashmead (1904a). The present writer suggested some new generic characters which are as follows: Pronotum of uniform width, anterior margin slightly concave in middle, posterior margin straight (Pl. 13, fig. E); first valvifers semicircular with basal and apical angles at different levels (Pl. 13, fig. H); third valvulae blunt, movably articulated with second valvifers (Pl. 13, fig. I); outer plates of ovipositor long, slightly shorter than second valvifers, with a mid-longitudinal ridge (Pl. 13, fig. J); subgenital plate with anterior margin straight, posterior margin with a semicircular notch in middle, postero-lateral ridges present (Pl. 13, fig. K); male genitalia with gonobase shorter than aedeagus, digitus with two projections (Pl. 13, fig. P).

Scotolinx quadristriata Subba Rao and Ramamani

(Plate 13, fig. A-P)

Scotolinx quadristriata Subba Rao and Ramamani, 1965, Indian J. Ent., 27: 412.

Female.

Head.- Orange yellow and setose, slightly wider than long in facial view (0.28:0.23 mm); frontovertex wider than long, width about one-half the total head width; ocelli red, arranged in obtuse triangle, lateral ocelli twice their own diameters from orbital margin and their own diameters from occipital margin; eyes red and smooth; malar sutures distinct; malar space longer than eye width; antennae inserted at lower level of eyes; mandibles bidentate with one acute and a broad truncation having serrations (fig. A); maxillary and labial palpi each 1-segmented (fig. B).

Antennae (fig. C).- Yellowish brown, 7-segmented excluding 2 ring segments; scape flattened, slightly more than three times as long as wide, about as long as club; pedicel one and a half times as long as wide, slightly shorter than first funicle segment; funicle 2-segmented, first slightly more than one and a half times as long as wide, longer than second; club 3-segmented, two and a half times as long as wide, slightly shorter than funicle.

Thorax (fig. D).- Orange yellow; pronotum of uniform width, anterior margin straight, slightly concave in middle, antero-lateral angles acute, posterior margin straight bearing 4 pairs of setae (fig. E); parapsidal furrows complete; scutum and scutellum with 6 and 4 setae respectively; meso-

postphragma well developed, not reaching beyond the propodeum.

Fore wings (fig. F).- Hyaline, slightly more than twice as long as wide (1.26:0.58 mm); costal cell as long as marginal vein and with 11 small setae; submarginal and marginal veins with 5 and 12 setae respectively; postmarginal slightly shorter than stigmal and one-fourth the length of marginal vein (fig. G); marginal fringe spaced by a distance equal to one-fourth their length.

Hind wings.- Hyaline, five and a half times as long as wide; marginal fringe one-third the wing width, spaced by a distance equal to one-fifth their length.

Legs (figs. L-N).- Yellow; middle tibial spur longer than basitarsus (fig. M).

Abdomen.- Yellow, except dorsum with four transverse brown bands, slightly longer than thorax; ovipositor slightly exserted, arising from base of abdominal venter; first valvifers semicircular, with basal and apical angles at different levels (fig. H); anterior margin of basal part of second valvifers much curved, U-shaped; third valvulae two and a half times as long as wide, about one-fifth the length of second valvifers (fig. I); outer plates of ovipositor long widened in middle with mid-longitudinal ridge, shorter than second valvifers (fig. J); subgenital plate with anterior margin straight,

PLATE 13

Figs. A-P. Scotolinx quadristriata Subba Rao & Ramamani

A. Mandible, ♀

B. Maxillary and labial palpi, ♀

C. Antenna, ♀

D. Propodeum and part of thorax in dorsal view, ♀

E. Pronotum, ♀

F. Fore wing, ♀

G. Part of fore wing venation, ♀

H. First valvifer, ♀

I. Second valvifer and third valvula, ♀

J. Outer plate of ovipositor, ♀

K. Subgenital plate, ♀

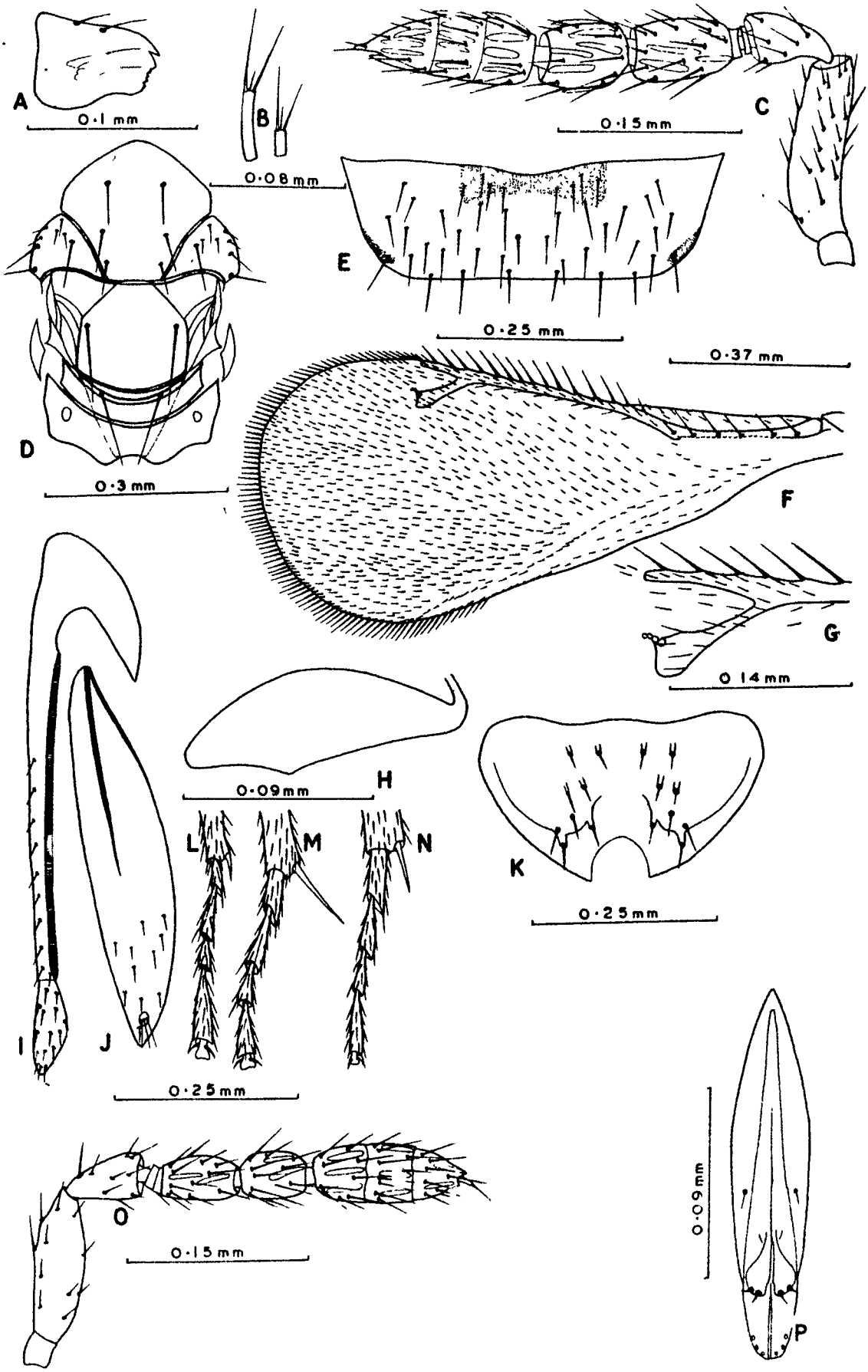
L. Part of fore leg, ♀

M. Part of middle leg, ♀

N. Part of hind leg, ♀

O. Antenna, ♂

P. Genitalia, ♂


A
0·1 mm
B
0·08 mm
C
0·15 mm
D
0·3 mm
E
0·25 mm
0·37 mm
F
G
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H
0·09 mm
I
J
0·25 mm
K
0·25 mm
L
M
N
O
0·15 mm
P
0·06 mm

PLATE 13

posterior margin with a semicircular notch in middle, postero-lateral ridges present (fig. K).

Female length: 1.38 mm.

Male.

Resembles female except in the following characters:

Male genitalia with gonobase shorter than aedeagus, digitus short with two projections (fig. P).

Male length: 0.98 mm.

Material examined: 2 ♀, 1 ♂, INDIA: Rajasthan, Udaipur, ex leaf mining Lepidoptera on Citrus sp., 1.x.1975 (M. Younus Khan).

4. Genus Euplectrus Westwood

Euplectrus Westwood, 1832, Phil. Mag., 3: 128.
Type-species: Euplectrus maculiventris Westwood = Pteromalus bicolor Swederus (Monobasic).

The genus Euplectrus was proposed by Westwood (1832) for the species Euplectrus maculiventris Westwood. The genera Diplectron Dahlbom and Pachyscapha Howard are generally considered as synonyms of Euplectrus Westwood by all the recent workers. Recently, Kerrich (1974) synonymized the genus

Rekabia Cameron with Euplectrus Westwood. The distinguishing characters of this genus have been given in detail by Nikol'skaya (1952) and Peck et al. (1964). Some new generic characters are suggested viz. Pronotum with anterior margin deeply concave in middle, antero-lateral arms long and narrow, posterior margin convex (Pl. 14, fig. D); first valvifers triangular with basal and apical angles at different levels (Pl. 14, fig. K); third valvulae rudimentary, articulated with second valvifers (Pl. 14, fig. L); outer plates of ovipositor narrow at base, broadened at apex (Pl. 14, fig. M); subgenital plate of uniform width, anterior margin straight, posterior margin with a wide notch in middle (Pl. 14, fig. N).

Key to some Indian species of Euplectrus Westwood, based on females

1. Abdominal petiole about twice as long as wide. 2
__ Abdominal petiole short, subquadrate or only slightly longer than wide. 3
2. Clypeus black like the rest of the head; abdominal petiole shagreened. . . . . .E. ceylonensis Howard
__ Clypeus yellow; abdominal petiole smooth. . . . . .E. petiolatus Ferrière
3. Mesonotum irregularly transversely striate, with a median carina. 4
__ Mesonotum reticulate without median carina. 5

4. Face and cheeks yellow; the longest hind tibial spur little longer than basal two tarsal joints together; petiole striate; pedicel slightly longer than wide. . . . . .E. leucostomus Rohwer

__ Face and cheeks except clypeus black; the longest hind tibial spur as long as basal two tarsal joints together; petiole regulose; pedicel twice as long as wide. . . . . .E. indicus Ferrière

5. Marginal vein longer than submarginal vein and thrice or more the length of stigmal vein; pedicel more than one and a half times as long as wide; longest hind tibial spur shorter than basal two tarsal joints together. 6

__ Marginal vein as long as submarginal vein and twice the length of stigmal vein; pedicel slightly longer than wide; longest hind tibial spur as long as basal two tarsal joints together; abdominal petiole slightly wider than long. . . . . .E. parvulus Ferrière

6. Face and cheek yellow; funicle segment first longer than following segments separately, segments 2-4 slightly longer than wide; abdominal petiole subquadrate. . . . . E. coimbatorensis Ferrière

__ Face and cheeks except clypeus dark; funicle segment first shorter than following segments separately,

segments 2-4 more than one and a half times as long as wide; abdominal petiole one and a half time as long as wide. . . . . E. gopimohani Mani

Euplectrus gopimohani Mani

(Plate 14, figs. A-N)

Euplectrus gopimohani Mani, 1941, Indian J. Ent., 3: 33.

Female. (Redescribed in detail).

Head (fig. A).- Dark with metallic reflections except clypeal region which is yellowish brown, triangular in facial view; frontovertex slightly more than twice as wide as long, width slightly more than half the total head width; ocelli white, arranged in obtuse triangle, lateral ocelli twice their own diameters from orbital margin and less than their own diameters from occipital margin; eyes dark brown and smooth; antennae inserted below lower level of eyes; prominence between antennal sockets less than one-third the width of frons between eyes; malar space longer than eye width; malar sutures distinct; maxillary and labial palpi 2 and 1-segmented respectively (fig. B).

Antennae (fig. C).- Brown except scape which is yellow, 8-segmented excluding two ring segments; scape cylindrical, slightly more than four times as long as wide (0.22:0.05 mm);

pedicel slightly less than twice as long as wide, slightly longer than first funicle segment; funicle 4-segmented, first shortest and twice as long as wide; segments 2-4 subequal in length, gradually widened distad, each more than one and a half times as long as wide; club 2-segmented, two and a half times as long as wide (0.15:0.06 mm), shorter than preceding two funicle segments together.

Thorax.- Dark with metallic reflections and reticulately sculptured; pronotum with anterior margin deeply concave in middle, antero-lateral arms long and narrow, posterior margin much convex bearing 3 pairs of long setae (fig. D); parapsidal furrows well developed; scutum wider than long; scutellum longer than wide; scutum, parapside and scutellum with 6, 4 and 4 setae respectively; axillae bare; propodeum with median carina (fig. E).

Fore wings (fig. F).- Hyaline, slightly more than twice as long as wide (1.5:0.7 mm); costal cell shorter than marginal vein and with 5 long and 10 small setae; submarginal and marginal veins with 3 and 13 setae respectively; stigmal vein less than one-third the length of marginal vein and one-half the length of postmarginal vein (fig. G); marginal fringe short, spaced by a distance equal to one-third their length.

Hind wings.- Hyaline, five times as long as wide;

marginal fringe short, spaced by a distance equal to one-half their length.

Legs (figs. H-J).- Honey yellow; tarsi 4-jointed; hind legs with two tibial spurs, longest tibial spur shorter than the length of basal two tarsal joints together (fig. J).

Abdomen.- Dark except a broad patch on mid of dorsum which is yellow; petiole one and a half times as long as wide; ovipositor concealed, arising from apical one-third of abdominal venter; first valvifers triangular with basal and apical angles at different levels, basal margin concave (fig. K); second valvifers of uniform width, third valvulae rudimentary, articulated with second valvifers (fig. L); outer plates of ovipositor narrow at base, widened at apex (fig. M); subgenital plate of uniform width, anterior margin straight, posterior margin with a wide notch in middle (fig. N).

Female length: 1.86 mm.

Material examined.- 1 ♀, INDIA: Uttar Pradesh, Aligarh, University Campus, ex Lepidopterous larva, 10.x.1977 (M. Younus Khan).

PLATE 14

Figs. A-N. *Euplectrus gopimohani* Mani

A. Head in dorsal view, ♀

B. Maxillary and labial palpi, ♀

C. Antenna, ♀

D. Pronotum, ♀

E. Propodeum and petiole in dorsal view, ♀

F. Fore wing, ♀

G. Part of fore wing venation, ♀

H. Part of fore leg, ♀

I. Part of middle leg, ♀

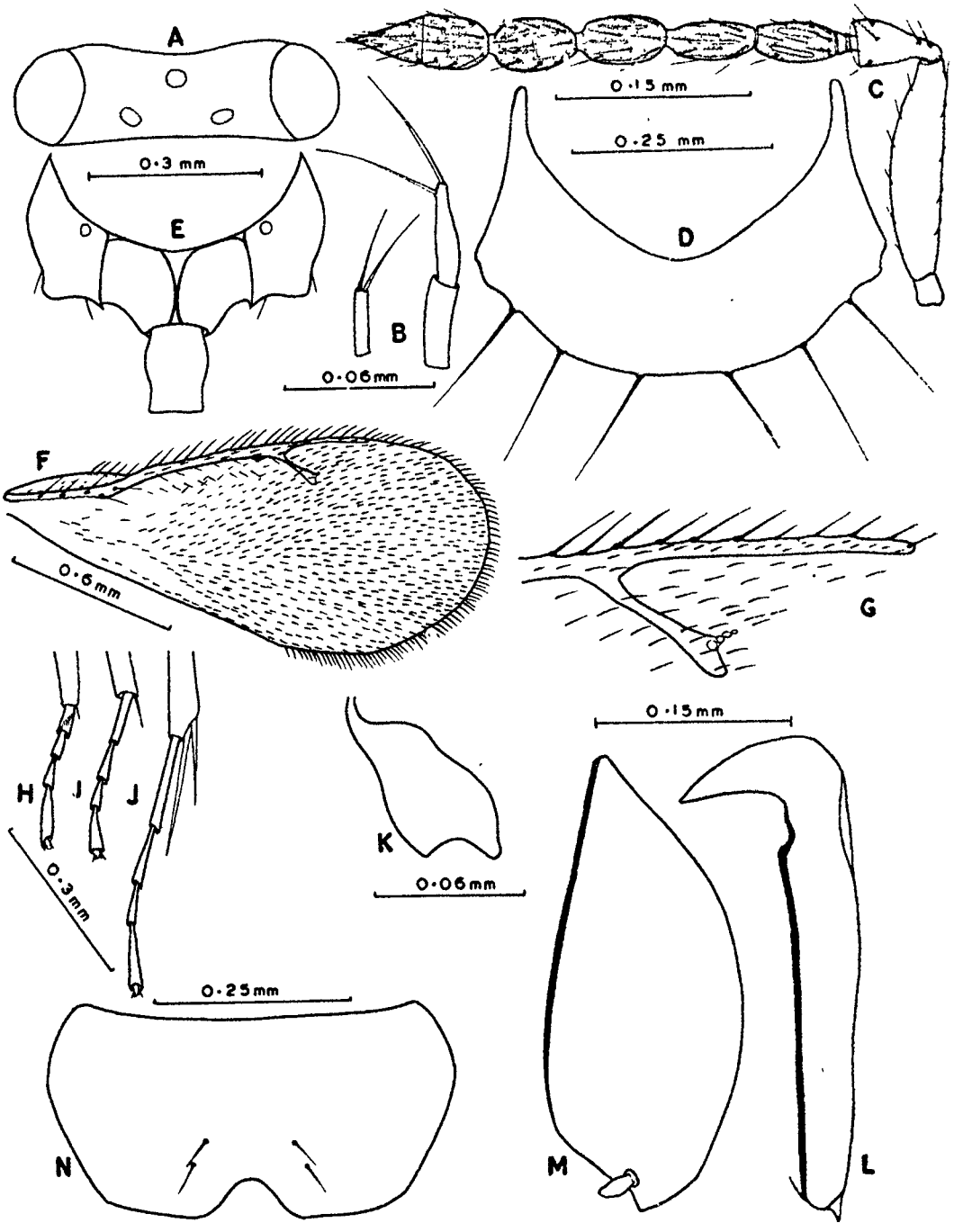
J. Part of hind leg, ♀

K. First valvifer, ♀

L. Second valvifer and third valvula, ♀

M. Outer plate of ovipositor, ♀

N. Subgenital plate, ♀


A
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E
B
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0·25 mm
C
D
F
0·6mm
G
H
J
J
0·3mm
K
0·06mm
0·15mm
0·25mm
N
M
L

PLATE 14

SUBFAMILY: EUDERINAE ERDÖS

KEY TO SOME GENERA OF THE SUBFAMILY EUDERINAE, BASED ON FEMALES

1. Antennae normal, not compressed and dilated; frons without large scale-like hairs. 2

__ Antennae compressed and dilated; frons with four large scale-like hairs; fore wings maculate. . Wichmannia Ruschka

2. Propodeum densely punctate, reticulate or coarsely sculptured, usually with distinct median carina. 3

__ Propodeum smooth, without median carina (Erdös, 1961, fig. 3); fore wings with two hair lines running from stigma (Pl. 15, fig. D); mandibles tridentate (Pl. 15, fig. A); maxillary and labial palpi each 2-segmented (Pl. 15, fig.B) . . . . . .Allocerastichus Masi

3. Wings without plain hair lines radiating from stigma (Pl. 15, fig. I; Bouček, 1963, figs. 15, 17 & 20). 4

__ Wings with three plain hair lines radiating from stigma (Bouček, 1963, figs. 1, 3 & 4). . . . . Euderus Haliday

4. Fore wings with dark patches (Bouček, 1963, figs. 15, 17 & 20; Peck et al., 1964, fig. 241); postmarginal and stigmal veins long; propodeum with two submedian carinae. . . . . Astichus Foerster

__ Fore wings hyaline (Pl. 15, fig. I; Peck et al., 1964, fig. 242); postmarginal and stigmal veins short; propodeum with one median carina. . . . . Euderastichus Bouček

5. Genus Allocerastichus Masi

Allocerastichus Masi, 1923, Ann. Mus. Civ. Stor. nat. Genova, 51: 146.

Type-species: Allocerastichus doderi Masi.

The genus Allocerastichus was proposed by Masi (1923) for the species Allocerastichus doderi Masi. Bouček (1963) regarded the genera Stipaebia Erdös and Euderinus Erdös as synonyms of Allocerastichus Masi. Further, he synonymized the species Allocerastichus almus Erdös and Allocerastichus obscurus Erdös with the type species of Euderastichus Bouček and the species Stipaebia verticillata Erdös and Euderinus hungaricus Erdös with the type species of Allocerastichus Masi. The generic characters proposed by Peck et al. (1964) apply well on the species under study. The genus is reported for the first time from India.

Allocerastichus longicorpus sp. n.

(Plate 15, figs. A-G)

Female.

Head.- Dark with metallic bluish reflections, wider than long in facial view; frontovertex distinctly wider than long, width slightly more than one-half the total head width; ocelli white, arranged in obtuse triangle, lateral ocelli by

their own diameters from orbital margin; eyes dark and smooth; malar space shorter than eye width; malar sutures distinct; antennae inserted just above lower level of eyes; mandibles tridentate, margins of mesal and lower teeth serrated (fig. A); maxillary and labial palpi each 2-segmented (fig. B).

Antennae (fig. C).- Dark except scape and pedicel which are yellowish brown, 9-segmented excluding two ring segments; scape cylindrical, five times as long as wide (0.25: 0.05 mm), longer than basal two funicle segments together; pedicel one and a half times as long as wide, slightly shorter than first funicle segment; funicle 4-segmented, segments 1-3 longer than wide, fourth slightly wider than long; club 3-segmented, about twice as long as wide (0.19:0.09 mm), distinctly longer than preceding two funicle segments together.

Thorax.- Dark with metallic bluish reflections and reticulately sculptured; pronotum campanulate; parapsidal furrows complete; scutum and scutellum without longitudinal grooves and with 32 and 2 setae respectively; posterior margin of scutellum rounded; propodeum smooth.

Fore wings (fig. D).- Hyaline, slightly more than twice as long as wide (1.76:0.85 mm); costal cell shorter than marginal vein and with 2 small setae; submarginal and marginal veins with 5 and 25 setae respectively; postmarginal vein twice the length of stigmal vein (fig. E); two hair lines

arising from apex of stigmal vein; a row of 3 long setae beneath marginal vein; cubital hair line absent; marginal fringe short, spaced by a distance equal to one-third their length.

Hind wings.- Hyaline, three and a half times as long as wide; marginal fringe short, spaced by a distance equal to one-fourth their length.

Legs.- Dark with metallic bluish reflections, except basal three tarsal joints which are white; basitarsus of fore legs with oblique row of setae (fig. F).

Abdomen (fig. G).- Dark with metallic bluish reflections, longer than head and thorax together; ovipositor exserted, arising from base of abdominal venter; subgenital plate not extending beyond the basal half of abdominal venter; tenth tergum long narrowing posteriorly; third valvulae long.

Female length: 3.02 mm.

Allocerastichus longicorpus sp. n. differs from the type species, Allocerastichus doderi Masi by the following key characters:

1. Lateral ocelli by more than twice their own diameters from orbital margin; cubital hair line present; post-marginal vein slightly longer than stigmal vein; three

hair lines extending from apex of stigmal vein; a row of 6 long setae beneath marginal vein; fourth funicle segment longer than wide (Erdös, 1961, fig. 3). . . . . A. doderi Masi

__ Lateral ocelli by their own diameters from orbital margin; cubital hair line absent; postmarginal vein twice the length of stigmal vein; two hair lines extending from apex of stigmal vein; a row of 3 long setae beneath marginal vein (Pl. 15, fig. D); fourth funicle segment slightly wider than long (Pl. 15, fig, C). . . . . .A. longicorpus sp. n.

Holotype ♀. INDIA: Uttar Pradesh, Aligarh, University Campus, ex Dipterous pupae, 10.iv.1976 (M. Younus Khan).

Paratype. 1♀ (Same data as holotype).

6. Genus Euderastichus Bouček

Euderastichus Bouček, 1963, Beitr. Ent., 13: 270.

Type-species: Euderus obscurus Thomson.

Bouček (1963) proposed the genus Euderastichus for the species Euderus obscurus Thomson. Further, he synonymized the species Allocerastichus almus Erdös and A. obscurus Erdös

with type species of his genus Euderastichus. The generic characters proposed by Bouček (1963) and Peck et al. (1964) apply well on the species under study. The genus is recorded for the first time from India.

Euderastichus nigricorpus sp. n.

(Plate 15, figs. H-K)

Female.

Head.- Dark with metallic bluish reflections, distinctly wider than long in facial view; frontovertex wider than long, width more than one-half the total head width; ocelli white, arranged in obtuse triangle, lateral ocelli by their own diameters from orbital and occipital margins; eyes reddish brown and smooth; antennae inserted just above lower level of eyes; malar space as long as eye width; malar sutures disctinct; mandibles tridentate.

Antennae (fig. H).- Dark except base of scape which is yellow; 9-segmented excluding 1 ring segment; scape cylindrical, slightly more than five times as long as wide (0.16:0.03 mm), slightly shorter than basal three funicle segments together; pedicel twice as long as wide, distinctly longer than first funicle segment; segments 1-4 gradually decreasing

in length distad, first slightly more than one and a half times as long as wide and with a thick seta at base; fourth slightly longer than wide; club 3-segmented, less than three times as long as wide, slightly longer than preceding three funicle segments together.

Thorax.- Dark with metallic bluish reflections; pronotum campanulate; parapsidal furrows complete; scutum wider than long and with 3 pairs of setae; scutellum with 2 pairs of setae; scutum and scutellum reticulately sculptured and without longitudinal grooves; propodeum with a median carina.

Fore wings (fig. I).- Faintly infumate, two and a half times as long as wide; costal cell slightly shorter than marginal vein and with 3 small setae; submarginal and marginal veins with 5 and 12 setae respectively; postmarginal vein slightly shorter than stigmal vein (fig. J); marginal fringe about one-sixth the wing width, spaced by a distance equal to one-sixth their length.

Hind wings.- Faintly infumate, about five times as long as wide (0.75:0.14 mm); marginal fringe spaced by a distance equal to one-sixth their length.

Legs.- Dark except apices of tibae, first tarsal joint of fore legs, basal two tarsal joints of mid and hind

legs which are yellow; basitarsus of fore legs with an oblique row of setae (fig. K).

Abdomen.- Dark; petiolate, longer than head and thorax together; ovipositor slightly exserted, arising from base of abdominal venter.

Female length: 1.46 mm.

Euderastichus nigricorpus sp. n. differs from the type of species, Euderastichus obscurus (Thomson) by the following key characters:

1. Pedicel as long as first funicle segment; first funicle segment more than twice as long as wide; club two and a half times as long as wide, as long as first and second funicle segments together (Boucek, 1963, fig. 13); postmarginal vein slightly longer than stigmal vein. . . . . .
. . . . . .E. obscurus (Thomson)

__ Pedicel distinctly longer than first funicle segment; first funicle segment less than twice as long as wide; club more than two and a half times as long as wide, longer than first and second funicle segments together (Pl. 15, fig. H); postmarginal vein shorter than stigmal vein (Pl. 15, fig. J). . . . . E. nigricorpus sp. n.

Holotype ♀. INDIA: Uttar Pradesh, Aligarh, ex Dipterous pupae, 10.iv.1976 (M. Younus Khan).

Paratype. 1 ♀ (same data as holotype).

PLATE 15

Figs. A–G. *Allocerastichus longicornus* sp.n.

A. Mandible, ♀

B. Maxillary and labial palpi, ♀

C. Antenna, ♀

D. Fore wing, ♀

E. Part of fore wing venation, ♀

F. Part of fore leg, ♀

G. Abdomen in dorsal view, ♀

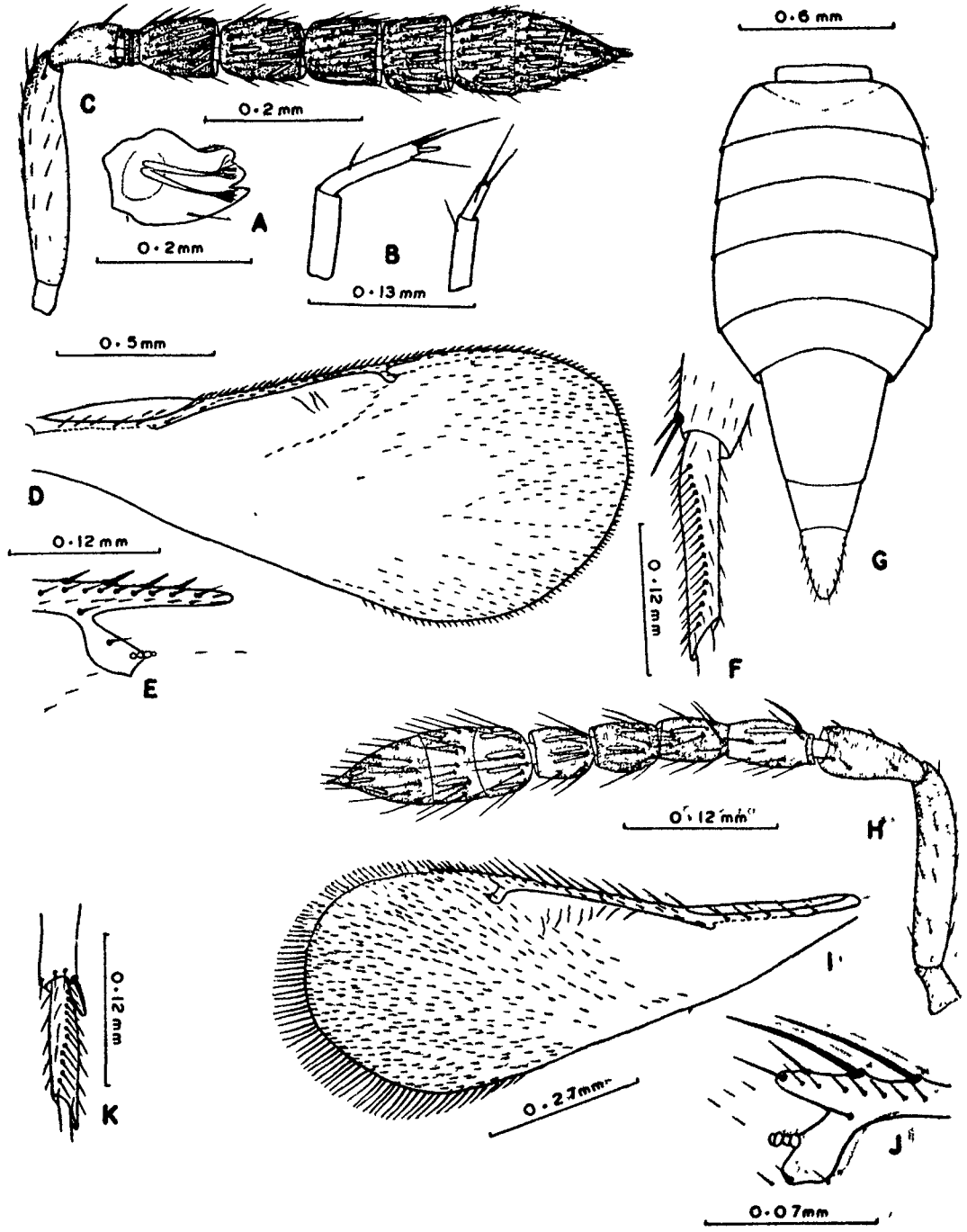
Figs. H–K. *Enderastichus nigricornus* sp.n.

H. Antenna, ♀

I. Fore wing, ♀

J. Part of fore wing venation, ♀

K. Part of fore leg, ♀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B
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D
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E
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G
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F
0·12 mm
H
I
0·27mm
K
0·12 mm
J
0·07mm

PLATE 15

SUBFAMILY: ENTEDONTINAE FOERSTER

KEY TO SOME GENERA OF THE SUBFAMILY ENTEDONTINAE, BASED ON FEMALES

1. Funicle 2 to 3-segmented. 2

__ Funicle 4-segmented, club 2-segmented; head with a deep median incision behind the ocellar area; temples densely hairy (Peck et al.,1964, fig. 239); fore wings semi-truncated at apex; propodeum with strong median carina in anterior half (Kerrich, 1969, fig. 10). . . . . .Derostenus Westwood

2. Funicle 2-segmented; club 3-segmented. 3

__ Funicle 3-segmented; club 2-segmented. 7

3. Parapsidal furrows absent (Peck et al., 1964, fig. 243; Edrös, 1966, fig. 9); postmarginal vein absent or moderately shorter than stigmal vein. 4

__ Parapsidal furrows usually partly indicated (Pl. 16, fig. E; Pl. 17, fig. E; Pl. 18, fig. C); postmarginal vein usually as long as or longer than stigmal vein. 5

4. Axilla situated anterior to base of scutellum; funicle segments wider than long, first shorter than second. . . . . Euderomphale Girault

__ Axilla less produced anterior to base of scutellum; funicle segments distinctly longer than wide, subequal in length. .. . . . . .Pediobopsis Girault

5. Marginal vein with setae much shorter than stigmal vein; thorax distinctly finely reticulate. 6

__ Marginal vein with setae about as long as stigmal vein; thorax smooth not reticulate; antennal club distinctly broader than funicle; abdomen subsessile. . Ceranisus Walker

6. Wings with more or less distinct row of setae extending distad from stigma, space between row and front margin of wing bare or nearly so (Pl. 16, figs. G & O); mandibles tridentate with two teeth acute and serration (Pl. 16, fig. A); (male genitalia with digitus having single projection Pl. 20, fig. K). . . . . .Chrysonotomyia Ashmead

__ Wings without distinct row of setae extending distad from stigma (Pl. 17, fig. G; Pl. 18, figs. D & O); mandibles bidentate (Pl. 17, fig. A; Pl. 18, fig. M); posterior margin of subgenital plate with a semicircular notch in middle (Pl. 17, fig. O; Pl. 18, fig. L); (male genitalia with digitus having two projections Pl. 20, fig. L). . . . Neochrysocharis Kurdjumov

7. Body strongly sclerotized; head and thorax not shrunken; pronotal collar margined. 8

__ Body weakly sclerotized; head and abdomen at least partly shrunken, sometimes also thorax; latter frequently weakly sculptured. 10

8. Scutellum without mid and submedian furrows; occiput margined above. 9

__ Scutellum with a median longitudinal and two lateral furrows; occiput not margined; propodeum with two submedian longitudinal granulated furrows (Peck et al., 1964, fig. 246). . . . . .Horismenus Walker

9. Propodeum with distinct median carina set in groove; abdomen sessile or rarely subsessile. . . . . Entedon Dalman

__ Propodeum with two submedian longitudinal carinae diverging from base and turning sideways at apex to join the complete and well developed lateral plicae; abdomen distinctly petiolate; pronotum with antero-lateral arms long and narrow, anterior margin deeply concave (Pl. 19, fig. E); third valvulae short, movably articulated with second valvifers (Pl. 19, fig. J); subgenital plate with anterior margin straight, posterior margin with a notch in middle (Pl. 19, fig. L); (male genitalia with aedeagus as long as gonobase, apex blunt; digitus short with two or three projections (Pl. 20, fig. M; Waterston, 1915, figs. 2 C & H). . .Pediobius Walker

10. Marginal vein moderately arched, anteriorly with weak and dense setae; wing disc densely setose; antenna uniformly setose; propodeum with narrow emargination embracing petiole, latter sometimes very long; abdomen usually broad; clypeal margin subtruncate; thorax frequently reticulate. . . . . .Chrysocharis Foerster

__ Marginal vein straight, with sparse and rather strong setae; wing disc sparsely setose; antenna with some whorls of setae; propodeum broadly emarginate; not embracing short petiole; abdomen usually more or less elongate; clypeal margin usually roundly protruding; thorax finely alutaceous. . . . . Omphale Haliday

7. Genus Chrysonotomyia Ashmead

Chrysonotomyia Ashmead, 1904, Mem. Carneg. Mus., 1: 344.

Type-species: Eulophus auripunctatus Ashmead.

The genus Chrysonotomyia was proposed by Ashmead (1904 a) for the species Eulophus auripunctatus Ashmead. Recently, Bouček (1977a) declared the genus Achrysocharis Girault as synonym of Chrysonotomyia Ashmead. The distinguishing characters of this genus have been given by Ashmead (1904 a). The present writer suggested some new generic characters which are as follows: Pronotum with posterior margin much curved, antero-lateral angles acute (Pl. 16, fig. D); first valvifers triangular with basal and apical angles at different levels (Pl. 16, fig. J); third valvulae short, movably articulated with second valvifers (Pl. 16, fig. K); outer plates of ovipositor long, narrow at base with a submarginal ridge along basal two-third of dorsal margin (Pl. 16, fig. L); male genitalia with gonobase slightly longer than aedeagus, digitus with single projection (Pl. 20, fig. K).

Key to some oriental species of Chrysonotomyia Ashmead, based on females

1. First funicle segment distinctly longer than wide, more

than one-half the length of pedicel; second funicle segment about twice as long as wide; postmarginal vein as long as or longer than stigmal vein; dorsum of head smooth; propodeum smooth and without median carina. . .2

___ First funicle segment distinctly wider than long, one-third the length of pedicel; second funicle segment more than twice as long as wide (Ferrière, 1931, fig. I); postmarginal vein much shorter than stigmal vein; dorsum of head punctate; propodeum with median carina. . . . . .C. promecothecae (Ferrière)

2. Fore wings elongate, more than twice as long as wide, apex rounded; submarginal and marginal veins with 2 and 16 setae respectively (Pl. 16, fig. G); postmarginal vein as long as stigmal vein (Pl. 16, fig. H); costal cell long and narrow; antennae with 2 ring segments. . . . . C. kerrichi sp. n.

___ Fore wings broad, less than twice as long as wide, apex broadly rounded; submarginal and marginal veins with 3 and 12 setae respectively (Pl. 16, fig. O); postmarginal vein longer than stigmal vein (Pl.16, fig. P); costal cell very small; antennae with 1 ring segment. . . . . C. latipennis sp. n.

Chrysonotomyia kerrichi sp. n.

(Plate 16, figs. A-M)

Female.

Head.- Orange yellow, slightly wider than long in facial view (0.44:0.4 mm); frontovertex slightly longer than wide, width one-third the total head width; ocelli red, arranged in equilateral triangle, lateral ocelli less than their own diameters from orbital margin and twice their own diameters from occipital margin; eyes red and sparsely setose; antennae inserted at lower level of eyes; prominence between antennal sockets about one-half the width of frons between eyes; malar space much shorter than eye width; malar sutures absent; mandibles tridentate with two acute teeth and a truncation which is serrated (fig. A); maxillary and labial palpi each 1-segmented (fig. B).

Antennae (fig. C).- Yellowish brown except scape which is yellow; 7-segmented excluding 2 ring segments; scape cylindrical, six times as long as wide (0.18:0.03 mm); pedicel more than twice as long as wide, longer than first funicle segment and subequal to second; funicle 2-segmented, first one and a half times as long as wide, second twice as long as wide and longer than first; club 3-segmented, five times as long as wide, much longer than funicle.

Thorax (fig. E).- Yellowish except scutum and mid of scutellum with metallic green reflections; pronotum with posterior margin much curved bearing two pairs of small setae, anterolateral angles acute (fig. D); scutum and scutellum reticulately sculptured and each with a pair of long setae and without longitudinal grooves; parapsidal furrows distinct anteriorly; mesopostphragma reaching just beyond the propodeum; propodeum without median carina.

Fore wings (fig. G).- Hyaline, more than twice as long as wide (1,26:0,56 mm), rounded at apex; a line of hairs extending distad of the stigmal vein to the wing margin, space between the line and front wing margin bare, another hair line (cubital) extending obliquely apex of submarginal vein to the base of outer wing margin; costal cell shorter than marginal vein and with 2 small setae; submarginal and marginal veins with 2 and 16 setae respectively; postmarginal vein as long as stigmal vein (0.08:0,08 mm) (fig. H); marginal fringe short, spaced by a distance equal to one-third their length.

Hind wings.- Hyaline, four and a half times as long as wide (0.63:0.14 mm); marginal fringe one-third the wing width, spaced by a distance equal to one-fourth their length.

Legs.- Orange yellow; tarsi 4-jointed; middle tibial spur shorter than basitarsus.

Abdomen (fig. I).- Yellow except dorsum with three brown transverse bands; longer than head and thorax together (0.88:0.82 mm); ovipositor slightly exserted, arising from base of abdominal venter; first valvifers triangular with basal and apical angles at different levels (fig. J); anterior margin of basal part of second valvifers much curved and U-shaped, third valvulae three times as long as wide, one-sixth the length of second valvifers (fig. K); outer plates of ovipositor long, narrow at base with a submarginal ridge along basal three-fourth of outer margin (fig. L).

Female length: 1.7 mm.

Male.

Resembles female except in the following characters:

Antennae with 1 ring segment; scape five and a half times as long as wide (0.17:0.03 mm); pedicel twice as long as wide; club four times as long as wide (0.16:0.04 mm) (fig. M); costal cell without setae; marginal vein with 11 setae; postmarginal vein longer than stigmal vein; abdominal dorsum with 6 transverse brown bands; male genitalia with gonobase as long as aedeagus, digitus short of uniform width and with single projection, aedeagal shaft long and blunt (Pl. 20, fig. K).

Male length: 0.98 mm.

Holotype ♀. INDIA: Uttar Pradesh, Aligarh, Jawahar Park ex Psyllid in leaf galls of Grewia asiatica Linn., 2.ix.1975 (M. Younus Khan).

Paratypes. 8 ♀, 1 ♂ (same data as holotype).

This species is named for Dr. G.J. Kerrich, in recognition of his contributions to our knowledge of the Chalcidoidea.

Chrysonotomyia latipennis sp.n.
(Plate 16, figs. N-P)

Female.

Head.- Dark with metallic green reflections except clypeal region which is yellow and reticulately sculptured, wider than long in facial view; frontovertex as wide as long, width more than one-third the total head width; ocelli yellowish, arranged in equilateral triangle, lateral ocelli by their own diameters from orbital margin and twice their own diameters from occipital margin; eyes red and smooth; antennae inserted above lower level of eyes; malar space shorter than eye width; malar sutures absent; maxillary and labial palpi each 1-segmented.

Antennae (fig. N).- Yellowish brown except scape which is yellow, 7-segmented excluding 1 ring segment; scape cylindrical, slightly more than five times as long as wide (0.16: 0.03 mm); pedicel twice as long as wide, longer than first funicle segment; funicle 2-segmented, first one and a half

times as long as wide, second twice as long as wide and slightly longer than first; club 3-segmented, five times as long as wide (0.15:0.03 mm), much longer than funicle.

Thorax.- Scutum, parapside, axillae except base, mid of scutellum, propodeum, meso and meta sternites dark with metallic reflections, rest of the thorax yellow; parapsidal furrows distinct anteriorly; scutum and scutellum with 4 and 2 setae respectively; propodeum smooth without median carina.

Fore wings (fig. Q).- Hyaline, less than twice as long as wide, apex broadly rounded; a line of hairs extending distad of the stigmal vein to the wing margin, space between the line and front margin of wing bare, another hair line (cubital) extending obliquely apex of submarginal vein to the base of outer wing margin; costal cell very narrow, much shorter than marginal vein; submarginal and marginal veins with 3 and 12 setae respectively; postmarginal vein longer than stigmal vein (fig. P); marginal fringe short, spaced by a distance equal to one-third their length.

Hind wings.- Hyaline, five times as long as wide; marginal fringe about one-half the wing width, spaced by a distance equal to one-fourth their length.

PLATE 16

Figs. A-M. Chrysonotomyia kerrichi sp. n.

A. Mandible, ♀

B. Maxillary and labial palpi, ♀

C. Antenna, ♀

D. Pronotum, ♀

E. Propodeum and part of thorax in dorsal view, ♀

F. Sculpture of scutum, ♀

G. Fore wing, ♀

H. Part of fore wing venation, ♀

I. Abdomen in dorsal view, ♀

J. First valvifer, ♀

K. Second valvifer and third valvula, ♀

L. Outer plate of ovipositor, ♀

M. Antenna, ♂

Figs. N-P. Chrysonotomyia latipennis sp. n.

N. Antenna, ♀

O. Fore wing, ♀

P. Part of fore wing venation, ♀

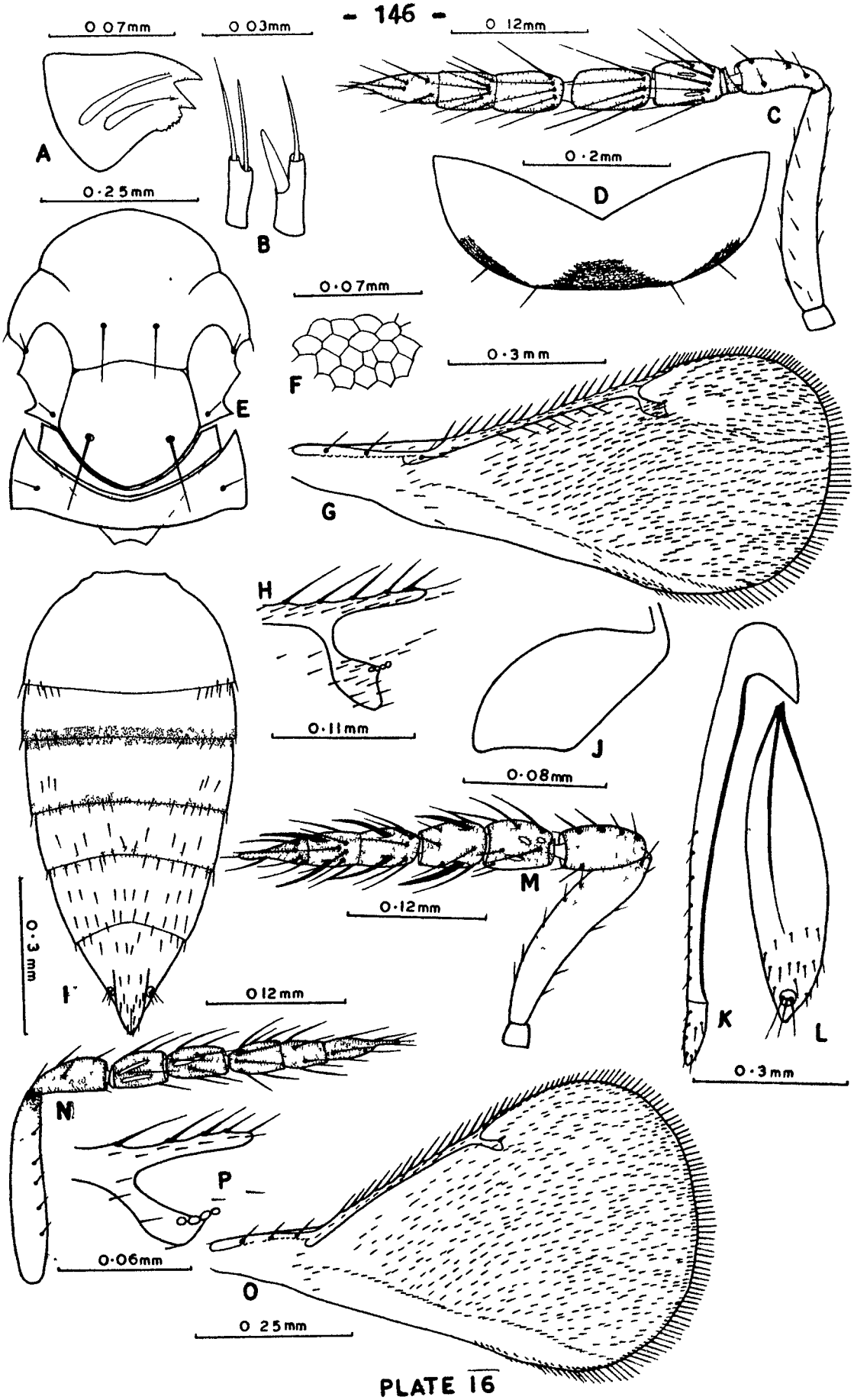
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PLATE 16

Legs.- Yellowish white except coxae which are slightly infuscated; tarsi 4-jointed; middle tibial spur shorter than basitarsus.

Abdomen.- Yellow except base of dorsum and venter completely dark with metallic reflections; longer than head and thorax together; ovipositor slightly exserted, arising from base of abdominal venter.

Female length: 1.15 mm.

Holotype ♀, INDIA: Uttar Pradesh, Aligarh, Hardwagunj ex in leaf galls of Mangifera indica Linn., 31.xii.1974 (M. Younus Khan).

Paratypes. 2 ♀ (same data as holotype).

8. Genus Neochrysocharis Kurdjumov

Neochrysocharis Kurdjumov, 1912, Russ. Ent. Rev., 12: 235. Type-species: Neochrysocharis immaculatus Kurdjumov.

The genus Neochrysocharis was proposed by Krudjumov (1912) for the species Neochrysocharis immaculatus Krudjumov. Kerrich (1969) synonymized the genus Proacrias Ihering with Neochrysocharis Krudjumov. Recently, Boučak (1977) revalidated the genus Proacrias Ihering on the basis of having carinae on

mid of propodeum. The specimens under study run well to the genus Neochrysocharis Kurdjumov in keys to genera proposed by Nikol'skaya (1952) and Peck et al. (1964). The present writer suggested some new generic characters which are as follows: Pronotum of uniform width, anterior margin slightly concave, posterior margin more or less straight (Pl. 17, fig. D; Pl. 18, fig. B); first valvifers triangular with basal and apical angles at different levels (Pl. 17, fig. L; Pl. 18, fig. I); third valvulae short, movably articulated with second valvifers (Pl. 17, fig. M; Pl. 18, fig. J); subgenital plate narrow, posterior margin with a semicircular notch in middle (Pl. 17, fig. O; Pl. 18, fig. L); male genitalia with gonobase as long as aedeagus, each digitus with 2 projections (Pl. 20, fig. L).

Key to Indian species of Neochrysocharis Kurdjumov, based on females

1. Disc of fore wings with hyaline setae; costal cell of fore wings much shorter than marginal vein; postmarginal vein shorter than stigmal vein. 2

__ Disc of fore wings with coarse setae; costal cell of fore wings slightly shorter than marginal vein; postmarginal vein as long as stigmal vein (Pl. 18, figs. O & P); submarginal and marginal veins with 2 and 10 setae respectively; pedicel twice as long as wide, club

three and a half times as long as wide. . . . . .
. . . . . N. pubipennis sp. n.

2. First funicle segment shorter than second; second funicle segment longer than wide (Pl. 17, fig. C); scape five times as long as wide; club four times as long as wide; marginal vein with 16 setae; axillae without transverse sutures. . . . . .N. hyalipennis sp. n.

__ Funicle segments first and second subequal in length; second funicle segment as long as wide (Pl. 18, fig. A); scape four times as long as wide; club three times as long as wide; marginal vein with 9 setae; axillae with transverse sutures. . . . . N. metallicus sp. n.

Neochrysocharis hyalipennis sp. n.

(Plate 17, figs. A-P)

Female.

Head.- Dark with metallic bluish reflections and reticulately sculptured, wider than long in facial view; frontovertex slightly wider than long, width one-half the total head width; ocelli white, arranged in obtuse triangle, lateral ocelli less than their own diameters from orbital and occipital margins separately; eyes red and smooth; malar space one-half the eye width; malar sutures absent; antennae inserted above lower level of eyes; prominence between antennal sockets one-

fourth the width of frons between eyes; scrobes deep and convergent above; frontal fork with arms obtusely diverging, apices touching the inner orbital margins; mandibles tridentate with two acute and one rudimentary teeth (fig. A); maxillary and labial palpi each 1-segmented (fig. B).

Antennae (fig. C).- Yellowish brown except basal two-third of scape which is white, 7-segmented excluding 2 indistinct ring segments; scape cylindrical, five and half times as long as wide; pedicel one and a half times as long as wide, slightly longer than first funicle segment; funicle 2-segmented, first as long as wide and shorter than second, second distinctly longer than wide; club 3-segmented, four times as long as wide (0.17:0.04 mm), longer than funicle.

Thorax (fig. E).- Dark with metallic bluish green reflections; dorsum reticulately sculptured; pronotum of uniform width, anterior margin slightly concave, posterior margin straight, bearing 3 pairs of setae (fig. D); parapsidal furrows distinct anteriorly and faint posteriorly; scutum and scutellum with 4 and 2 setae respectively; mesopostphragma not reaching beyond the propodeum; propodeum without median carina.

Fore wings (fig. G).- Hyaline, slightly less than twice as long as wide (0.94:0.5 mm); rounded at apex; disc with hyaline setae; a line of hairs extending obliquely apex of

submarginal vein to the base of outer wing margin; costal cell narrow, shorter than marginal vein; submarginal and marginal veins with 2 and 16 setae respectively; postmarginal vein well developed, shorter than stigmal vein (fig. H); marginal fringe short, spaced by a distance equal to one-half their length.

Hind wings.- Hyaline, six times as long as wide; disc with hyaline setae; marginal fringe long, one-half the wing width.

Legs (figs. I-K).- White except coxae which are dark brown; tarsi 4-jointed; middle tibial spur shorter than basitarsus (fig. J).

Abdomen.- Brown with metallic reflections, slightly longer than head and thorax together, ovipositor slightly exserted, arising from basal one-third of abdominal venter; first valvifers triangular with basal and apical angles at different levels (fig. L); third valvulae three and a half times as long as wide, one-fifth the length of second valvifers (fig. M); outer plates of ovipositor slightly longer than second valvifers (fig. N); subgenital plate narrow, posterior margin with a small semicircular notch in middle (fig. O).

Female length: 1.38 mm.

PLATE 17

Figs. A-P. Neochrysocharis hyalipennis sp. n.

A. Mandible, ♀

B. Maxillary and labial palpi, ♀

C. Antenna, ♀

D. Pronotum, ♀

E. Propodeum and part of thorax in dorsal view, ♀

F. Sculpture of scutum, ♀

G. Fore wing, ♀

H. Part of fore wing venation, ♀

I. Part of fore leg, ♀

J. Part of middle leg, ♀

K. Part of hind leg, ♀

L. First valvifer, ♀

M. Second valvifer and third valvula, ♀

N. Outer plate of ovipositor, ♀

O. Subgenital plate, ♀

P. Antenna, ♂

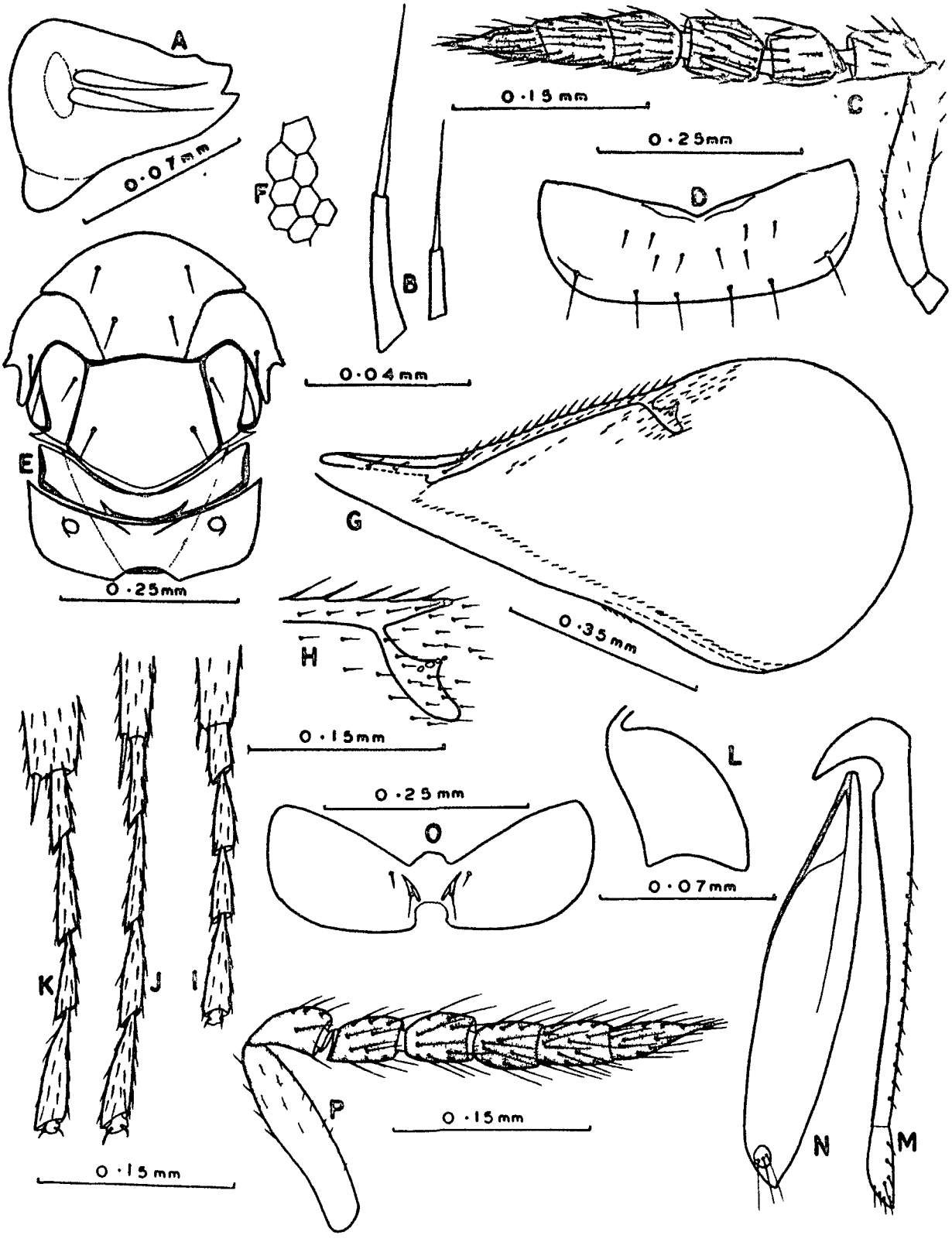
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PLATE 17

Male.

Resembles female except in the following characters:

Scape four times as long as wide; funicle segments first and second subequal, each distinctly longer than wide; club five and a half times as long as wide (fig. P); fore wings twice as long as wide (0.88:0.44 mm); submarginal vein with 3 setae; postmarginal vein about as long as stigmal vein (0.05:0.05 mm); male genitalia with gonobase as long as aedeagus, digitus short and with 2 projections, aedeagal shaft short and blunt (Pl. 20, fig. L).

Male length: 1.01 mm.

Holotype ♀. INDIA: Uttar Pradesh, Aligarh, University Campus, ex Coccus sp. on Carica papaya, 1.v.1977 (M. Younus Khan).

Paratypes. 3 ♀. 1 ♂ (same data as holotype).

Neochrysocharis metallicus sp. n.

(Plate 18, figs. A-L)

Female.

Head.- Dark with metallic bluish reflections and reticulately sculptured, wider than long in facial view; frontovertex as long as wide, width slightly less than one-half the total head width; ocelli white, arranged in obtuse triangle,

lateral ocelli by their own diameters from eye and occipital margins; eyes red and sparasely setose; antennae inserted above lower level of eyes; prominence between antennal sockets one-fourth the width of frons between eyes; malar space shorter than eye width; malar sutures absent; mandibles tridentate with two acute and one rudimentary teeth; maxillary and labial palpi each 1-segmented.

Antennae (fig. A).- Dark except scape which is yellow, 7-segmented excluding 2 indistinct ring segments; scape four times as long as wide (0.13:0.03 mm); pedicel slightly longer than wide, slightly longer than first funicle segment; funicle 2-segmented, segments first and second subequal, each about as long as wide; club 3-segmented, slightly less than three times as long as wide, much longer than funicle.

Thorax (fig. C).- Dark with metallic bluish reflections and reticulately sculptured; pronotum with anterior margin slightly concave, posterior margin slightly curved bearing 3 pairs of setae (fig. B); parapsidal furrows indicating anteriorly, reaching upto scutellum by grooves; scutum wider than long and with 4 setae; each parapside with a transverse suture; scutellum as long as wide and with a pair of setae; mesopostphragma short, not reaching beyond the propodeum; propodeum smooth and without median carina.

Fore wings.- Hyaline, twice as long as wide, disc with hyaline setae; a line of hairs extending obliquely apex of submarginal vein to the base of outer wing margin; costal cell shorter than marginal vein; submarginal and marginal veins with 2 and 9 setae respectively (fig. D); postmarginal vein well developed, shorter than stigmal vein (fig. E); marginal fringe short, spaced by a distance equal to one-third their length.

Hind wings.- Hyaline, five and a half times as long as wide, disc with hyaline setae; marginal fringe long, one-half the wing width.

Legs (figs. F-H).- White except coxae which are brown; middle tibial spur shorter than basitarsus (fig. G).

Abdomen.- Brown with metallic bluish reflections, about as long as head and thorax together; ovipositor slightly exserted, arising from basal one-third of abdominal venter; first valvifers triangular with basal and apical angles at different levels (fig. I); third valvulae two and a half times as long as wide and about one-fifth the length of second valvifers (fig. J); outer plates of ovipositor slightly shorter than second valvifers (fig. K); subgenital plate narrow, anterior margin deeply concave, posterior margin with a notch in middle (fig. L).

Female length: 1.03 mm.

Holotype ♀. INDIA: Karnatka, Bangalore, ex Coccus sp. on Mangifera indica Linn., 30.vi.1975 (M. Younus Khan).

Paratypes. 2 ♀ (same data as holotype).

Neochrysocharis pubipennis sp. n.

(Plate 18, figs. M-S)

Female.

Head.- Dark with metallic bluish reflections and reticulately sculptured, wider than long in facial view; frontovertex wider than long, width more than one-half the total head width; ocelli reddish, arranged in obtuse triangle, lateral ocelli less than their own diameters from orbital and by their own diameters from occipital margin; eyes red and sparsely setose; antennae inserted just above lower level of eyes; prominence between antennal sockets one-third the width of frons between eyes; malar space shorter than eye width; malar sutures absent; mandibles tridentate with two acute and one rudimentary teeth (fig. M); maxillary and labial palpi each 1-segmented.

Antennae (fig. N).- Dark except scape which is yellow, 7-segmented excluding 2 indistinct ring segments; scape cylindrical, four times as long as wide (0.13:0.03 mm), about as

long as club; pedicel slightly less than twice as long as wide, longer than first funicle segment; funicle 2-segmented, segments first and second subequal in length each as long as wide; club 3-segmented, three and a half times as long as wide, longer than funicle.

Thorax.- Dark with metallic bluish reflections and reticulately sculptured; parapsidal furrows indicating anteriorly; scutum as long as wide and with 2 setae near each parapsidal furrow; scutellum with a pair of setae; mesopostphragma not reaching beyond the propodeum; propodeum smooth and without median carina.

Fore wings (fig. O).- Hyaline, slightly less than twice as long as wide (0.7:0.38 mm), apex broadly rounded, disc with coarse setae; a line of hairs extending obliquely apex of submarginal vein to the base of outer wing margin; costal cell slightly shorter than marginal vein; submarginal and marginal veins with 2 and 10 setae respectively; postmarginal vein well developed, as long as stigmal vein (fig. P); marginal fringe short, spaced by distance equal to one-third their length.

Hind wings.- Hyaline; disc with coarse setae; marginal fringe long, one-half the wing width.

Legs (figs. Q-S).- Yellowish except coxae which are brown; mid tibial spur shorter than basitarsus (fig. R).

PLATE 18

Figs. A-L. *Neochrysocharis metallicus* sp.n.

A. Antenna, ♀

B. Pronotum, ♀

C. Part of thorax and propodeum completely in dorsal view, ♀

D. Fore wing venation, ♀

E. Part of fore wing venation, ♀

F. Part of fore leg, ♀

G. Part of middle leg, ♀

H. Part of hind leg, ♀

I. First valvifer, ♀

J. Second valvifer and third valvula, ♀

K. Outer plate of ovipositor, ♀

L. Subgenital plate, ♀

Figs. M-S. *Neochrysocharis pubipennis* sp.n.

M. Mandible, ♀

N. Antenna, ♀

O. Fore wing, ♀

P. Part of fore wing venation, ♀

Q. Part of fore leg, ♀

R. Part of middle leg, ♀

S. Part of hind leg, ♀

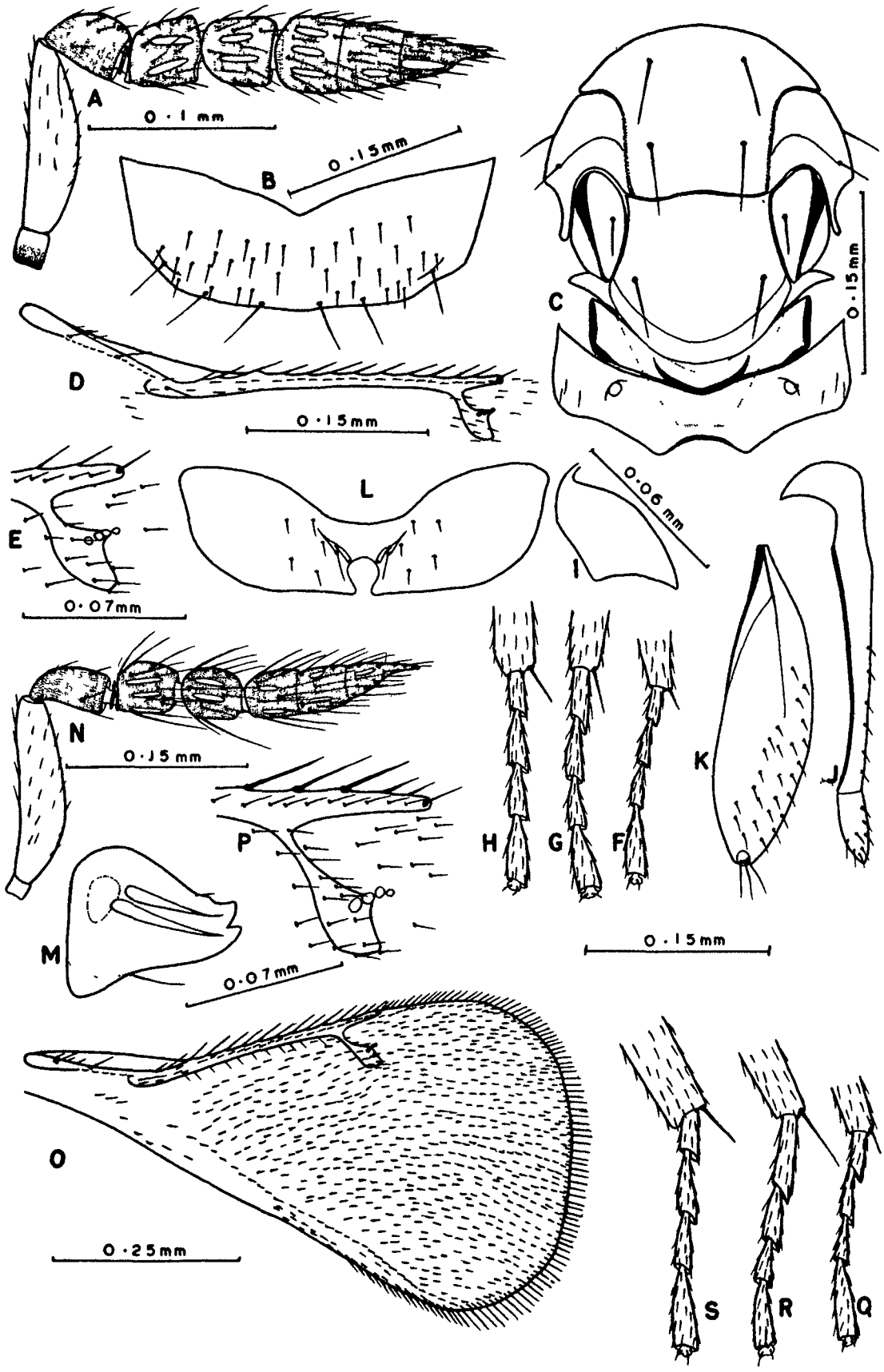
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PLATE 18

Abdomen.- Dark with metallic bluish reflections, slightly shorter than head and thorax together; ovipositor slightly exserted, arising from basal one-third of abdominal venter; third valvulae short, movably articulated with second valvifers.

Female length: 1.03 mm.

Holotype.♀. INDIA: Uttar Pradesh, Aligarh, University Agriculture Farm, ex Pulvinaria sp. on Azadirchta indica, 10.v.1977 (M. Younus Khan).

Paratypes. 2 ♀ (same data as holotype).

9. Genus Pediobius Walker

Pediobius Walker, 1846, Ann. Mag. Nat. Hist., 17: 184.
Type-species: Entedon imbreus Walker. Designated by Ashmead (1904 a).

The genus Pediobius was proposed by Walker (1846). Ashmead (1904 a) designated Entedon imbreus Walker as type species of the genus Pediobius Walker. Gahan (1921) synonymized the genera Pseudacriasoides Girault and Epipleurotropis Girault with Pleurotropis Foerster. Nikol'skaya (1952) recognized Pediobius Walker and Pleurotropis Foerster as valid genera and separated them on the basis of presence of

incomplete and complete parapsidal furrows. Gahan (1932), Ferrière (1953), Askew (1962), Peck (1963) and Bouček (1965) synonymized the genera Pseudacrias Girault, Pleurotropis Foerster, Rhopalotus Foerster, Eupleurotropis Girault and Cluthaira Cameron respectively with Pediobius Walker. Bouček (1965) declared the genus Microterus Spinola to be a synonym of Pediobius Walker and said "As Pediobius is today already a well-established and well-known name, it is taken here as the valid name for the genus and, consequently, Microterus, although older than the former name, is dropped into synonymy". He made a comprehensive study of the European species of the genus Pediobius. The generic characters proposed by Peck et al. (1964) and Bouček (1965) apply well on the species under study. The present writer suggested some new generic characters which are as follows: Pronotum with antero-lateral arms long and narrow, anterior margin deeply concave, posterior margin convex (Pl. 19, fig. E); first valvifers semicircular with basal and apical angles at different levels (Pl. 19, fig. I); third valvulae short, movably articulated with second valvifers (Pl. 19, fig. J); subgenital plate with anterior margin straight, posterior margin with a triangular notch in middle (Pl. 19, fig. L); male genitalia with gonobase as long as aedeagus, digitus short each with 2-3 projections (Pl. 20, fig. M; Waterston, 1915b, fig. 2, C & H).

Key to some Oriental species of Pediobius Walker, based on females

1. Mesoscutum without transverse fold. 2

__ Mesoscutum with straight, deep, transverse fold across the middle connecting the parapsidal furrows; behind this fold and extending to the posterior margin is a deep, broad, rectangular depression divided by a median longitudinal ridge. . . . . P. anomale Gahan

2. First funicle segment more than one and a half times as long as wide, second and third distinctly longer than wide. 3

__ First funicle segment atmost slightly longer than wide, second and third subquadrate or wider than long. . . . 5

3. Cubital hair line absent; speculum open. 4

__ Cubital hair line present; speculum closed (Tachikawa, 1976, fig. 2 c); pedicel shorter than first funicle segment; first funicle segment slightly less than twice as long as wide, second one and a half times, third slightly longer than wide; club shorter than preceding two funicle segments together (Tachikawa, 1976, fig. 2 a). . . . . .P. foveolatus (Crawford)

4. Pedicel as long as first funicle segment; first funicle segment one and a half times as long as wide, as long as second (Ferrière, 1933, fig. 5a); postmarginal vein

as long as stigmal vein. . . . . .P. painei Ferrière

__ Pedicel much shorter than first funicle segment; first funicle segment twice as long as wide, longer than second (Pl. 19, fig. N); postmarginal vein longer than stigmal vein. . . . . .P. longicorpus sp. n.

5. Pedicel less than one and a half times as long as wide, shorter than first funicle segment. 6

__ Pedicel one and a half times as long as wide, as long as first funicle segment; cubital hair line present; second and third funicle segments distinctly wider than long; club longer than preceding two funicle segments together. . . . . P. obtusiceps Bouček

6. Pedicel as long as wide; second and third funicle segments wider than long (Ferrière, 1933, fig. 5 c); lateral striations on the scutellum very weak, less parallel (Ferrière, 1933, fig. 6 c).P. parvulus Ferrière

__ Pedicel slightly longer than wide; second and third funicle segments subquadrate (Ferrière, 1933, fig. 5 b); lateral striations on the scutellum strong subparallel (Ferrière, 1933, fig. 6 b). . . . . .P. imbreus (Walker)

Pediobius obtusiceps Bouček*

(Plate 19, figs. A-M)

Pediobius obtusiceps Bouček, 1965, Acta. ent. Nat. Mus. Pragae, 36: 47.

*Reared from spider eggs. However, it is included for the purpose of identification.

Female. (Redescribed in detail).

Head.- Dark with metallic bluish reflections, reticulately sculptured and setose, wider than long in facial view; frontovertex distinctly wider than long, width more than one-half the total head width; ocelli brown, arranged in obtuse triangle, lateral ocelli by their own diameters from orbital and occipital margins separately; frontal fork with arms obtusely diverging; eyes silvery; malar space as long as eye width; malar sutures absent; antennae inserted at lower level of eyes; prominence between antennal sockets one-fifth the width of frons between eyes; mandibles with two acute teeth (fig. A); maxillary and labial palpi each 1-segmented (fig. B).

Antennae (fig. C).- Dark with metallic reflections, 7-segmented excluding 1 ring segment; scape four times as long as wide (0.16:0.04 mm), slightly longer than club; pedicel one and a half times as long as wide, as long as first funicle segment; funicle 3-segmented, segments 1-3 gradually decreasing in length and increasing in width distad; first funicle segment distinctly longer than wide, second and third distinctly wider than long; club 2-segmented, slightly more than twice as long as wide (0.13:0.06 mm), longer than preceding two funicle segments together.

Thorax (fig. D).- Dark with metallic bluish green reflections; parapsidal furrows distinct anteriorly; pronotum

with antero-lateral arms long and narrow, anterior margin deeply concave, posterior margin convex, posterior sub-marginal ridge distinct bearing 3 pairs of long setae (fig. E); scutum with reticulate and scutellum with longitudinal reticulate sculpture (fig. D); scutum and scutellum with 4 and 2 setae respectively; propodeum with a submedian carina diverging back wards, intercarinial space raised.

Fore wings (fig. F).- Hyaline, twice as long as wide (1.15:0.52 mm), sparsely setose; cubital hair line present, speculum closed; costal cell much shorter than marginal vein; submarginal and marginal veins with 2 and 12 setae respectively; postmarginal vein slightly shorter than stigmal vein (fig. G); a row of 14 setae beneath the marginal vein; marginal fringe short, spaced by a distance equal to one-third their length.

Hind wings.- Hyaline, four and a half times as long as wide (0.86:0.19 mm); marginal fringe short, spaced by a distance equal to one-third their length.

Legs.- Coxae, trochanters, femora and tibiae of all legs dark with metallic bluish reflections, tarsi of fore legs completely and pretarsus of mid and hind legs brownish, tarsal joints 1-3 of mid and hind legs white; fore legs with two small tibial spurs; middle tibial spur longer than basitarsus; hind tibial spur long, slightly longer than basitarsus (fig. H).

Abdomen.- Petiolate, dark with metallic bluish reflections, shorter than head and thorax together; first abdominal tergite well developed, reaching beyond the mid of abdomen; ovipositor slightly exserted, arising from basal one-half of abdominal venter; first valvifers semicircular with basal and apical angles at different levels (fig. I); second valvifers long and narrow, more or less of uniform width, anterior margin of basal part much curved, U-shaped; third valvulae twice as long as wide, one-tenth the second valvifers (fig. J); outer plates of ovipositor slightly shorter than second valvifers (fig. K); subgenital plate of uniform width with anterior margin straight, posterior margin with a triangular notch in middle (fig. L).

Female length: 1.58 mm.

Male.

Resembles female except in the following characters:

Pedicel slightly shorter than first funicle segment; second funicle segment slightly longer than wide; club as long as preceding two funicle segments together (fig. M); fore wings slightly less than twice as long as wide (0.83:0.46 mm); abdomen much shorter than thorax; male genitalia with gonobase as long as aedeagus, digitus short with 3 projections, aedeagal shaft short and blunt (Pl. 20, fig. M).

Male length: 0.98 mm.

The specific characters proposed by Bouček (1965)[ ] for the species Pediobius obtusiceps Bouček apply well on the Indian material except minor differences which do not appear sufficient to make it a new species. This species is reported for the first time from India.

Material examined.- 8 ♀, 1 ♂, INDIA: Rajasthan, Udaipur, ex eggs of spider, on Citrus sp., 2.x.1975 (M. Younus Khan).

Pediobius longicorpus sp. n.

(Plate 19, figs. N & O)

Female.

Head.- Dark with metallic bluish reflections and reticulately sculptured, wider than long in facial view; frontovertex twice as wide as long, width more than one-half the total head width; ocelli red, arranged in obtuse triangle, lateral ocelli by their own diameters from orbital and closed to occipital margins; eyes silvery and smooth; malar space slightly shorter than eye width; malar sutures absent; antennae inserted at lower level of eyes.

Antennae (fig. N).- Dark brown, 7-segmented excluding 2 ring segments; scape cylindrical, six times as long as wide (0.3:0.05 mm), longer than club; pedicel one and a half times as long as wide, shorter than first funicle segment; funicle 3-segmented; first funicle segment twice as long as wide, longer

than following segments separately; segments second and third subequal in length, each one and a half times as long as wide; club 2-segmented, two and a half times as long as wide (0.19: 0.07 mm), shorter than preceding two funicle segments together.

Thorax.- Dark with metallic bluish reflections and reticulately sculptured; parapsidal furrows distinct anteriorly by depressions; scutum and scutellum with 6 and 2 setae respectively; propodeum with median carinae diverging posteriorly.

Fore wings.- Hyaline, twice as long as wide (1.85:0.92 mm); costal cell broad, shorter than marginal vein; cubital hair line absent, speculum open; submarginal and marginal veins with 3 and 21 setae respectively (fig. 0); marginal fringe short, spaced by a distance equal to one-third their length.

Hind wings.- Hyaline, four times as long as wide; marginal fringe short, spaced by a distance equal to one-third their length.

Fore legs.- Dark except mid-longitudinal area of tibiae and basal three tarsal joints white.

Middle legs.- Dark except apex of femora, base and apical half of tibiae and basal three tarsal joints white.

Hind legs.- Colouration same as middle legs.

PLATE 19

Figs. A-M. *Pediobius obtusiceps* Bouček

A. Mandible, ♀

B. Maxillary and labial palpi, ♀

C. Antenna, ♀

D. Part of thorax in dorsal view, ♀

E. Pronotum, ♀

F. Fore wing, ♀

G. Part of fore wing venation, ♀

H. Part of hind leg, ♀

I. First valvifer, ♀

J. Second valvifer and third valvula, ♀

K. Outer plate of ovipositor, ♀

L. Subgenital plate, ♀

M. Antenna, ♂

Figs. N & O. *Pediobius longicorpus* sp. n.

N. Antenna, ♀

O. Fore wing venation, ♀

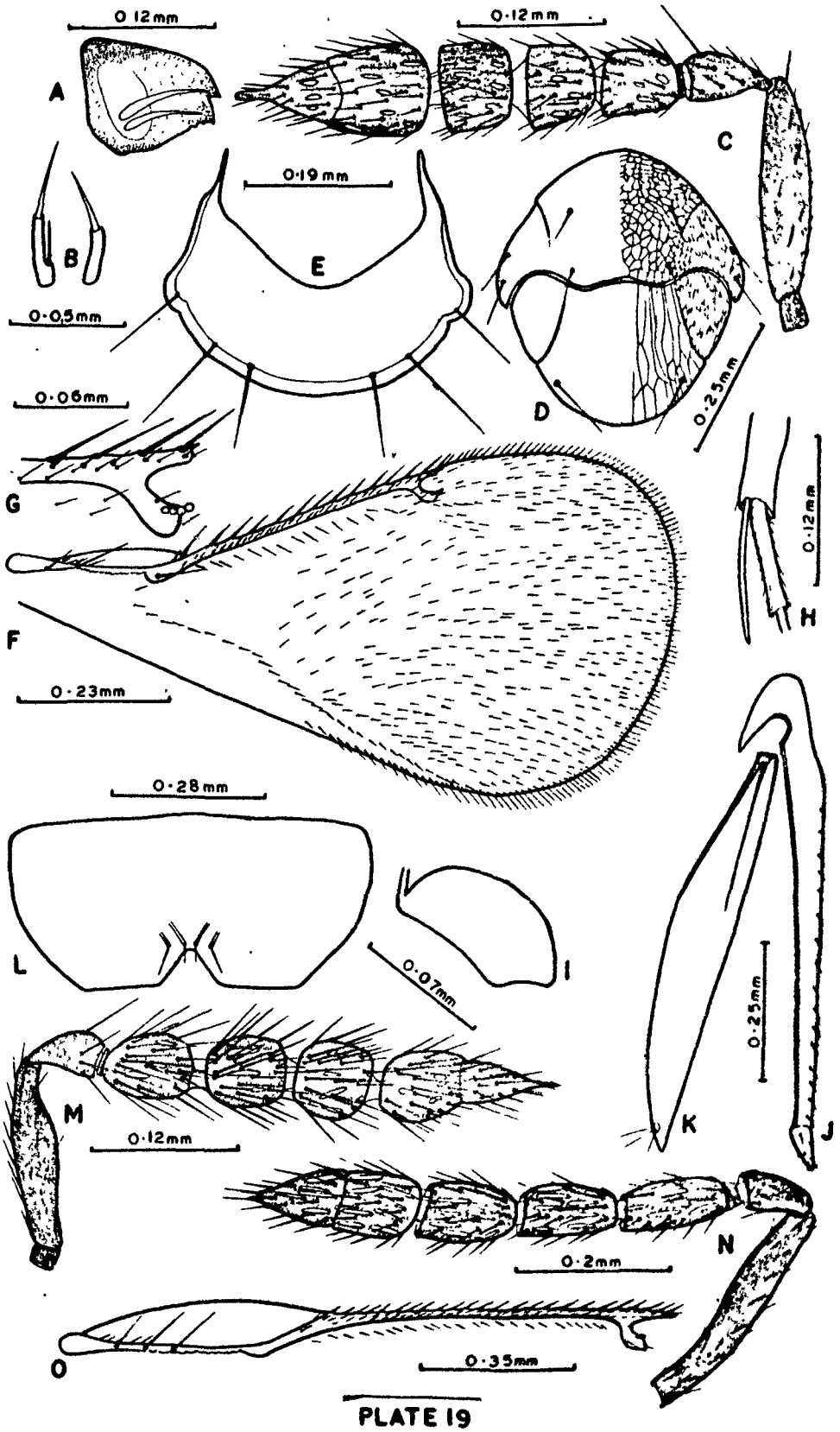
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PLATE 19

Abdomen.- Brownish, with purplish reflections, longer than head and thorax together; first abdominal tergite one-fourth the abdominal length; ovipositor slightly exserted, arising from base of abdominal venter.

Female length: 2.5 mm.

Holotype ♀. INDIA: Uttar Pradesh, Aligarh, University Campus, ex Dipterous pupae, 10.ix.1977 (M. Younus Khan).

Paratypes. 2 ♀ (same data as holotype).

PLATE 20

Figs. A-N. Male genitalia:

A. *Tetrastichus indicus* sp. n.

B. *Tetrastichus aligarhensis* sp. n.

C. *Tetrastichus burksi* sp. n.

D. *Tetrastichus annulicornis* sp. n.

E. *Tetrastichus manmohani* sp. n.

F. *Tetrastichus nainitalensis* sp. n.

G. *Tetrastichus flavus* sp. n.

H. *Tetrastichus metallicus* sp. n.

I. *Tetrastichus ajmerensis* sp. n.

J. *Syntomosphyrum udaipurensis* sp. n.

K. *Chrysonotomyia kerrichi* sp. n.

L. *Neochrysocharis hyalipennis* sp. n.

M. *Pediobius obtusiceps* Bouček

N. *Scotolinx quadristriata* Subba Rao & Ramamani

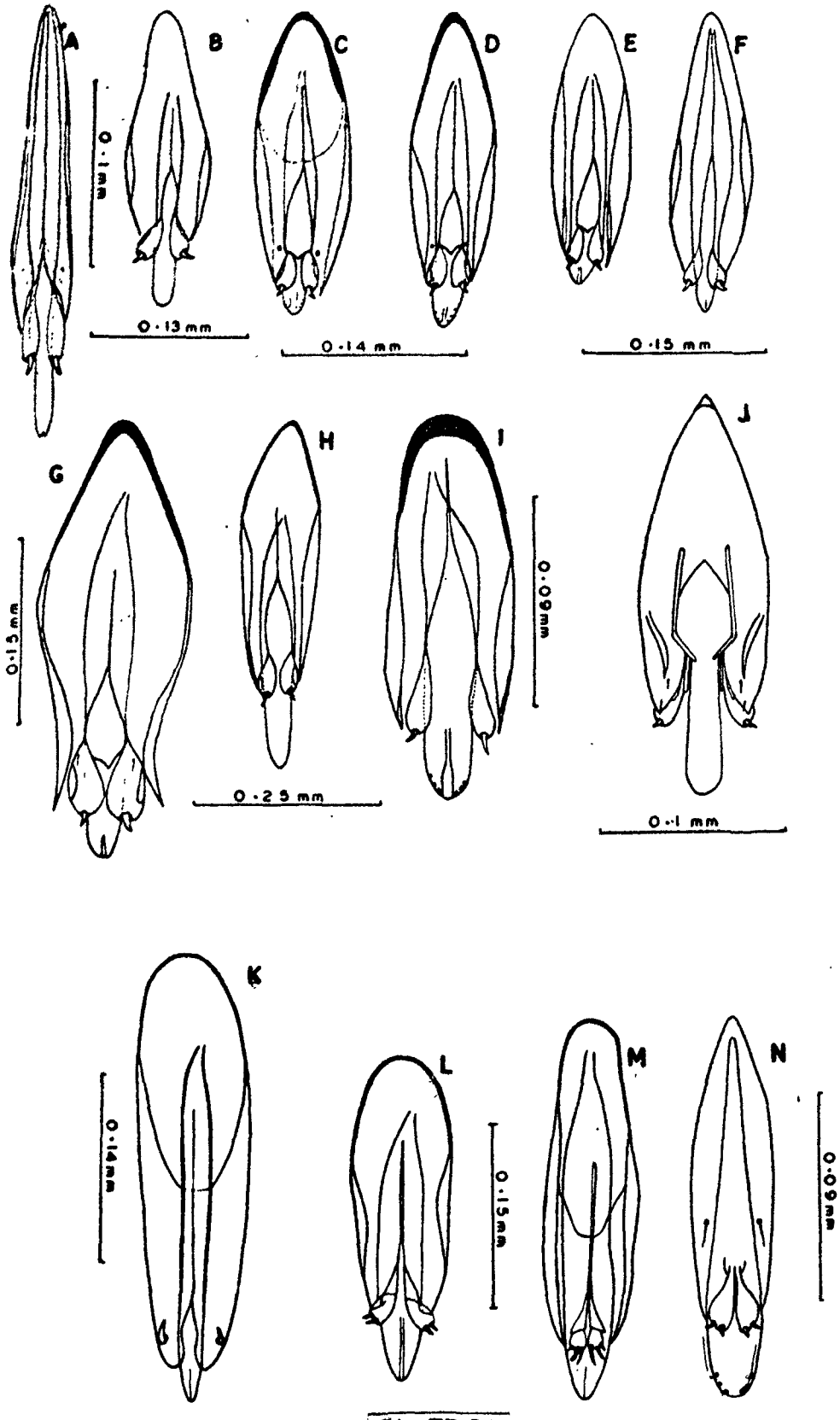
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PLATE 20

PART II

V. FAMILY: APHELINIDAE THOMSON

INTRODUCTION

The genus Aphelinus was first proposed by Dalman (1820). This is generally considered as type genus of the family Aphelinidae. Westwood (1833 a,b) proposed three genera: Pteroptrix, Agonioneurus and Coccophagus under the group parasitic Hymenoptera. Later, he (1840) placed them in the subfamily Encyrtides of the family Chalcididae. Nees (1834) erected the genus Myina. Walker (1839) synonymized Agonioneurus Westwood and Coccophagus Westwood with Aphelinus Dalman. The same author (1846) revalidated the genus Coccophagus Westwood.

Foerster (1856) discarded the genera Aphelinus Dalman and Agonioneurus Westwood, and placed Myina Nees and his four newly proposed genera: Mesidia, Trichaporus, Gyrolasia and Myima in the family Myinoidae. He (1878) proposed the family Coccophagoidae and described two new genera: Encarsia and Centrodora in it.

Thomson (1876) revalidated the genus Aphelinus Dalman and proposed the tribe Aphelinina. Howard (1881) raised the tribe Aphelinina to the subfamily rank Aphelininae. He (1894 a & c, 1895 a & b, 1898 and 1900) proposed nine genera: Ablerus, Aspidiotiphagus, Prospalta, Physcus, Aneristus, Perissopterus,

Archenomus, Azotus and Aphytis in the subfamily Aphelininae.

Ashmead (1904 a) considered Aphelininae as subfamily of Eulophidae and divided it into two tribes: Aphelinini and Pteroptricini, principally based on the number of tarsal joints. He gave new name Prospaltella to Prospalta Howard, since the later was preoccupied by a genus described by Walker (1857) in Lepidoptera.

Howard (1907) upholds Ashmead (1904 a) in dividing the subfamily Aphelininae into two tribes: Aphelinini and Pteroptricini. Further, he proposed four genera, Cales, Casca, Bardylis and Artas in the tribe Pteroptricini. He for the first time emphasized the character of presence or absence of speculum in classifying the genera having 5-jointed tarsi.

Schmiedeknecht (1909) again demoted the subfamily Aphelininae to the rank of tribe Aphelinini and the tribes: Aphelinini and Pteroptricini to the rank of subtribes Aphelinina and Pteroptricina respectively.

Mercet (1912) followed Schmiedeknecht (1909) in dividing the tribe Afelininos into two subtribes, Afelinos and Pteroptrinos. He described 25 genera and 156 species in the tribe Afelininos.

Girault (1915) considered Aphelininae as subfamily of Encyrtidae and followed Ashmead (1904 a) and Howard (1907) in dividing the subfamily into two tribes: Aphelinini and

Pteroptricini. He proposed two genera, Coccophagoides and Myocnemella in Aphelinini and two genera, Apteroptrix and Neocasca in Pteroptricini. The same author (1911 , 1916 c) proposed the genera, Euderomphale and Tumidiscapus in Aphelininae.

Vireck (1916) for the first time raised the subfamily Aphelininae to the family rank Aphelinidae. Further, he raised the tribes: Aphelinini and Pteroptricini to the subfamily rank, Aphelininae and Pteroptricinae respectively. Mercet (1930) added a third subfamily Calesinae to the family Aphelinidae in order to accommodate the genus Cales Howard.

Compere (1936) described 10 genera and 80 species of Aphelinidae, of which one genus and 12 species were new to science. He provided separate keys to species of all the genera described by him.

Mani (1938) followed Ashmead (1904 a) in retaining Aphelininae as a subfamily of Eulophidae. He named the tribes Aphelinini and Pteroptricini as Aphelinariae and Pteroptricariae respectively. He recorded 7 genera and 14 species in Aphelinariae and one genus and one species in Pteroptricariae from Indian region.

De Santis (1946) demoted the family Coccophagoidae Foerster to the rank of subfamily Coccophaginae. Further, he divided the family Aphelinidae into three subfamilies: Calesinae,

Aphelininae and Coccophaginae, mainly based on the shape of fore wings, arrangement of discal setae, number of tarsal joints and presence or absence of speculum in fore wings. He dropped the subfamily Pteroptricinae and distributed its genera: Eretmocerus Haldeman to the subfamily Aphelininae, and Casca Howard, Bardylis Howard, Artas Howard, Pteroptrix Westwood and Archenomus Howard to the subfamily Coccophaginae. The same author (1948) recorded 14 genera and 38 species of Aphelinidae from Argentina, of which 5 species were new to science.

Muesebeck et al. (1951) followed Ashmead (1904 a) and Mani (1938) in regarding Aphelininae as subfamily of Eulophidae. They catalogued 18 genera and 89 species from America and north of Mexico.

Nikol'skaya (1952) gave a key to 20 genera of the family Aphelinidae from U.S.S.R. She discarded the system of classifying the family Aphelinidae into subfamilies and tribes adopted by previous workers. She (1963) proposed two genera Aphelosoma and Bestiola in Aphelinidae.

Ghesquière (1955) placed the genera Eriaporus Waterston, Eunotiscus Compere, Euryischia Riley and Myiocnema Ashmead in his newly proposed subfamily Eriaporinae of the family Aphelinidae. Subba Rao (1969c) synonymized the genus Eriaporus Waterston with Promuscidea Girault and shifted it to the family Pteromalidae. Shafee (1975) shifted the genera Euryischia Riley, Myiocnema

Ashmead and Euryischomyia Girault to his newly proposed family Euryischidae.

Alam (1956) emphasised for the first time the generic importance of pronotum, subgenital plate and external female genitalia. He described 7 genera and 11 species from Great Britain. These characters have been later used by Agarwal (1964 a,b), Nikol'skaya and Jasnosh (1966), Hayat (1971 a,b), Shafee (1973a) and Shafee and Khan (1978). In this respect his work may be taken as a new approach to the classification of the genera giving more stability to them.

Peck (1963) catalogued 19 genera and 121 species of Aphelinidae from the Nearctic region. Peck et al. (1964) followed Nikol'skaya (1952) in discarding the system of classifying the family Aphelinidae into subfamilies and tribes adopted by previous workers. They gave a key to 19 genera of the family Aphelinidae.

Agarwal (1964 a & b) followed Nikol'skaya (1952) and Peck et al. (1964) in discarding the system of classifying aphelinids into subfamilies and tribes. He described 10 genera and 16 species of Aphelinidae from Indian region.

Erdös (1964) divided the family Aphelinidae into three subfamilies: Aphelininae, Pteroptricinae and Eriaporinae. Ferrière (1965) added the subfamily Coccophaginae thereby,

putting four subfamilies in the family Aphelinidae (Aphelininae, Coccophaginae, Pteroptricinae and Eriaporinae). His classification was principally based on number of tarsal joints, presence or absence of speculum in the fore wings and length of post-marginal vein. He gave a key to genera of each subfamily.

Nikol'skaya and Yasnosh (1966) divided the family Aphelinidae into five subfamilies: Aphelininae, Coccophaginae, Calesinae, Azotinae and Prospaltellinae, principally based on the shape of fore wings, length of marginal fringe, presence or absence of speculum in fore wings, number of tarsal joints and position of subgenital plate. They followed De Santis (1946) in dropping the subfamily Pteroptricinae. They distributed its genera, Eretmocerus Haldeman to the subfamily Aphelininae, and Pteroptrix Westwood, Artas Howard, Hispaniella Mercet, Archenomus Howard and Bardylis Howard to their newly proposed subfamily Prospaltellinae. They excluded the subfamily Eriaporinae from Aphelinidae.

Annecke & Insley (1970) emphasized on the structure and forms of prepectus in Aphelinidae and said "Detailed study of it through out the family may yield information of value in assessing relationships of -and within the family". They divided the aphelinid genera into two groups on the basis of divided and continuous condition of prepectus.

Hayat (1971 a & b; 1972 a, b & c; 1973; 1974 a, b & c), Shafee (1970; 1972a; 1973a and 1974) and Khan and Shafee (1976) made some important contributions on the Indian genera of the family Aphelinidae.

Yasnosh (1976) recognized seven subfamilies: Aphelininae, Coccophaginae, Calesinae, Prospaltellinae, Azotinae, Physcinae and Aphytinae. The last two were proposed as new subfamilies by himself. According to him the number of tarsal segments, the structure of forewings and antennae are subject to considerable simplification and reduction and their taxonomic importance can not exceed generic categories. He emphasized the subfamilial importance of the character of divided and undivided condition of pronotum, prepectus; male genitalia and host relationship. The first character, as a matter of fact, was earlier recorded as new generic character by Alam (1956) and the second as group character by Annecke and Insley (1970). Lastly, he gave the diagnostic characters of each subfamily. He further subdivided the subfamily Aphytinae into two tribes: Aphytini and Centrodorini on the basis of condition of body, exserted or unexserted condition of ovipositor, condition of fore wings and their hosts as important characters.

Recently, Shafee and Khan (1978) proposed a new subfamily Eretomocerinae in order to accommodate the genus Eretmocerus

Haldeman. They recognised only four subfamilies: Eretmocerinae, Pteroptricinae, Aphelininae and Coccophaginae in the family Aphelinidae and separated them on the basis of number of tarsal joints and presence or absence of speculum in fore wings. Further, they divided the subfamilies Aphelininae and Coccophaginae each into two tribes, principally based on presence or absence of membranous area in mid of pronotum.

The present writer followed Shafee and Khan's (1978) system of classifying Aphelinids into subfamilies and tribes. Further, he fully agreed with them in giving tribal value to presence or absence of membranous area in mid of pronotum. He made a detailed study of pronotum, external female genitalia and subgenital plate in 14 genera of the family Aphelinidae. In his generic keys based on females, he not only employed the generic characters used by earlier workers but also used new generic characters proposed by him. The present work contains the study of 14 genera and 33 species of Aphelinidae of which 5 species are new to science.

REVISED KEY TO SUBFAMILIES OF APHELINIDAE THOMSON

1. Tarsi 4-jointed. 2

__ Tarsi 5-jointed. 3

2. Fore wings with speculum (Pl. 21, figs. F & H; Pl. 22, figs. E & K; Compere, 1936, figs. 18 & 19 F; De Santis,

1948, fig. 28; Nikol'skaya and Yasnosh, 1966, figs. 89, 118 & 123; Rosen, 1966, fig. 127; Hayat, 1972 c, figs.2, 6, 11, 13 & 15; Yasnosh, 1974, fig. 2). . . . . .ERETMOCERINAE Shafee & Khan

__ Fore wings without speculum (Compere, 1936, fig. 12; Nikol'skaya, 1952, figs. 403 & 405; Alam, 1956, figs. 29, 30 & 38; Annecke, 1963, figs. 27, 32 & 33; Nikol'skaya and Yasnosh, 1966, figs. 105, 107, 110, 111, 365, 394, 399, 407, 418, 421, 427, 432 & 438). . . . . .PTEROPTRICINAE ASHMEAD

3. Fore wings with speculum . . . . . .APHELININAE Howard

__ Fore wings without speculum. . . .COCCOPHAGINAE Foerster

SUBFAMILY: ERETMOCERINAE SHAFEE & KHAN

Ashmead (1904 a), Howard (1907) and Mercet (1912) gave tribal value to the number of tarsal joints and placed the genus Eretmocerus Haldeman in the tribe Pteroptricini. Ferrière (1965) and Rosen (1966) followed earlier workers and placed Eretmocerus in the subfamily Pteroptricinae. However, De Santis (1946, 1948) and Nikol'skaya and Yasnosh (1966) discarded earlier workers in giving subfamilial importance to the number of tarsal joints, instead they laid emphasis to the presence or absence of speculum in fore wings and placed the genus Eretmocerus in the subfamily Aphelininae. Recently, Shafee and Khan (1978) gave

subfamilial significance to both the characters i.e. number of tarsal joints and presence or absence of speculum in fore wings and on this basis they proposed a new subfamily Eretmocerinae for the genus Eretmocerus Haldeman. The subfamily is characterized for having 4-jointed tarsi, presence of speculum in the fore wings. The differences between Eretmocerinae and Pteroptricinae are about as those between Aphelininae and Coccophaginae.

1. Genus Eretmocerus Haldeman

Eretmocerus Haldeman, 1850, Amer. Jour. Sci., 9: 111.

Type-species: Eretmocerus corni Haldeman (Monobasic).

Ricinusa Risbec, 1951, Mem. Inst. franc. Afr. noire., 13: 403.

Type-species: Ricinusa aleyrodiphaga Risbec.

The genus Eretmocerus was proposed by Haldeman (1850) for the species E. corni Haldeman. The species belonging to this genus are generally parasites of white flies. The distinguishing characters of this genus have been given in detail by Compere (1936), Nikol'skaya (1952), Peck et al. (1964) and Nikol'skaya and Yasnosh (1966). Some new generic characters are suggested which are as follows: pronotum formed of two separate pieces and a membranous area in middle, anterior margin V-shaped, posterior margin straight (Pl. 21, fig. D; Pl. 22,

fig. C); first valvifers triangular with basal and apical angles at different levels (Pl. 21, fig. H); subgenital plate with anterior margin straight, posterior margin semicircular with a notch in middle (Pl. 21, fig. K); male genitalia with gonobase much shorter than aedeagus, aedeagal shaft long and narrow, digitus long and of uniform width and without projections (Pl. 22, fig. H; Nikol'skaya and Yasnosh, 1966, fig. 121). Two new and two described species are represented here. Compere's (1936) key to species is revised in order to accommodate E. indicus Hayat, E. gunturiensis Hayat, E. mashhoodi Hayat, E. aligarhensis sp. n. and E. longipilus sp. n.

Revised key to species of Eretmocerus Haldeman, based on females

1. Pedicel more than three times as long as wide. 2
__ Pedicel not more than three times as long as wide. . . 4
2. Pedicel less than five times as long as wide. 3
__ Pedicel five times as long as wide (Compere, 1936, fig. 19 A); basal part of fore wings slightly infuscated; marginal vein about twice as long as stigmal vein; marginal fringe length about one-third the greatest wing width (Compere, 1936, fig. 19 H). . .E. clauseni Compere
3. Marginal vein slightly longer than stigmal vein; marginal fringe length one-third the greatest wing width (Compere, 1936, fig. 18); funicle segments first triangular, second transverse (Compere, 1936, fig. 19 B;

Hayat, 1972 c, fig. 1); two rows of setae bordering speculum proximally. . . . . E. haldemani Howard

__ Marginal vein twice as long as stigmal vein (Hayat, 1972 c, fig. 6); marginal fringe length one-sixth greatest wing width; funicle segments first and second subequal in length and width (Hayat, 1972 c, fig. 4); one row of setae bordering speculum proximally. . . . . E. indicus Hayat

4. Fore wings clear beneath the stigmal vein. 5

__ Fore wings infuscated beneath the stigmal vein. . . . . E. australis Girault

5. Club cylindrical or spatulate. 6

__ Club fusiform. . . . . .E. californicus Howard

6. Club cylindrical, slender; first funicle segment much smaller than second, almost ring like. 7

__ Club spatulate; first funicle segment triangular or ventral margin longer than dorsal margin or quadrate. . 8

7. First funicle segment 3-4 times as wide as long; club 7-8 times as long as wide; fore wings twice as long as wide; 7-8 coarse setae bordering speculum proximally. . . . . .E. serius Silvestri

__ First funicle segment about twice as wide as long; club nine times as long as wide (Hayat, 1972 c, fig. 12); fore wings two and a half times as long as wide; 11 coarse setae bordering speculum proximally (Hayat, 1972 c, fig. 13). . . . . E. gunturiensis Hayat

8. Marginal fringe length one-half or more the greatest wing width; fore wings sparsely setose. 9

__ Marginal fringe length less than one-half the greatest wing width; fore wings usually densely setose. 10

9. Marginal fringe length one-half the greatest wing width; pedicel about three times as long as wide; club slightly more than five times as long as wide (Pl. 21, fig. C); marginal vein twice the length of stigmal vein (Pl. 21, fig. F). . . . . .E. aligarhensis sp. n.

__ Marginal fringe length more than two-third the greatest wing width; pedicel two and a half times as long as wide; club six times as long as wide (Pl. 21, fig. L); marginal vein less than twice the length of stigmal vein (Pl. 21, fig. M). . . . . .E. longipilus sp. n.

10. First funicle segment triangular, usually much shorter than second. 11

__ First funicle segment not triangular and subequal to second (Nikol'skaya and Yasnosh, 1966, fig. 122; Hayat, 1972 c, fig. 14). . . . . E. mundus Mercet

11. Club usually less than five times as long as wide. . .12

__ Club at least five times as long as wide. 14

12. Club widening from base to almost the apex, apex truncated. 13

__ Club widening evenly from the base to about the middle, then from the middle gradually rounded on the dorsal margin to the apex, the apex shaped like parrot's beak.. . . . . .E. portoricensis Dozier

13. Club three times as long as wide; pedicel twice as long as wide; club as long as the length of radicle and scape together; ventral margin of first funicle segment as long as second segment (Compere, 1936, fig. 19 c). . . . . .E. longipes Compere

__ Club four times as long as wide; pedicel more than twice as long as wide; club longer than the length of radicle and scape together; ventral margin of first funicle segment shorter than second (Rosen, 1966, fig. 126). . . . . E. diversiciliatus Silvestri

14. Dominently yellow or organe yellow large species. . . 15

__ Dominently yellowish white species; club comparatively slender, six times as long as wide; a small species ranging from 0.35 to 0.43 mm in length. . . . . .E. pallidus Dozier

15. Marginal vein with 3 setae; marginal fringe length more than one-fourth the greatest wing width. 16

__ Marginal vein with 4 setae; marginal fringe length one-fifth the greatest wing width (De Santis, 1948, fig. 25 A). . . . . E. corni Haldeman

16. Mesoscutum with 3 setae near each parapsidal furrow; speculum bordered by more than 11 setae (Pl. 22, fig. E; Hayat, 1972 c, fig. 11); mesopostphragma longer than meso and metanotum together (Pl. 22, fig. D). . . . . .E. mashhoodi Hayat

__ Mesoscutum with 2 setae near each parapsidal furrow; speculum bordered by 9 setae (Pl. 22, fig. K; De Santis, 1948, fig. 26; mesopostphragma shorter than meso and metanotum together (Pl. 22, fig. J; De Santis, 1948, fig. 26). . . . . .E. paulistis Hempel

Eretmocerus aligarhensis sp. n.

(Plate 21, figs. A-K)

Female.

Head.- Yellow, slightly wider than long in facial view; frontovertex slightly wider than long; ocelli white, arranged in obtuse triangle; lateral ocelli slightly more than their own diameters from orbital and occipital margins separately; eyes reddish brown, smooth; malar space twice the eye width; malar sutures distinct; antennae inserted just above oral margin; mandibles tridentate (fig. A); maxillary and labial palpi 2 and 1-segmented respectively (fig. B).

Antennae (fig. C).- Yellow; scape cylindrical, five and a half times as long as wide (0.11:0.02 mm); pedicel three times as long as wide (0.06:0.02 mm), much longer than funicle; funicle 2-segmented; first funicle segment slightly wider than long, second as long as wide; club spatulate, slightly more than five times as long as wide (0.16:0.03 mm).

Thorax (fig. E).- Yellow; pronotum formed of two pieces, with a membranous area in middle, anterior margin V-shaped, posterior margin straight and with 6 pairs of setae, anterolateral angles acute (fig. D); scutum with 2 setae near each parapsidal furrow; scutellum with 2 pairs of setae; mesopostphragma shorter than the length of mesonotum.

Fore wings (fig. F).- Hyaline, three times as long as wide (0,51:0.17 mm), disc sparsely setose; costal cell longer than marginal vein; submarginal vein with 2 setae and 10 bullae; marginal vein twice as long as stigmal vein and with 3 setae; postmarginal vein absent; speculum bordered by a single row of 6 setae proximally; marginal fringe length one-half the greatest wing width.

Hind wings.- Hyaline, seven times as long as wide; marginal fringe length more than wing width.

Legs.- Yellow; tarsi 4-jointed; middle basitarsus as long as following two tarsal joints together; middle tibial spur less than one-half the length of basitarsus (fig. G).

Abdomen.- Yellow, longer than thorax; ovipositor slightly exserted, arising from basal one-third of abdominal venter; first valvifers triangular with basal and apical angles at different levels (fig. H); second valvifers long and of uniform width, third valvulae movably articulated with second valvifers

(fig. I); outer plates of ovipositor with thick ridge along dorsal margin (fig. J); subgenital plate with anterior margin straight, posterior margin semicircular with a notch in middle (fig. K).

Female length: 0.63 mm.

Holotype ♀. INDIA: Uttar Pradesh, Aligarh, ex Aleyrodes sp. on Lantana indica, 15.viii.1975 (M. Younus Khan).

Paratypes. 4 ♀ (same data as holotype).

Eretmocerus longipilus sp. n.

(Plate 21, figs. L-N)

Female.

Head.- Orange yellow, wider than long in facial view; frontovertex wider than long; ocelli white, arranged in obtuse triangle, lateral ocelli more than their own diameters from orbital margin and twice their own diameters from occipital margin; eyes reddish brown, smooth; malar space shorter than eye width; malar sutures distinct; mandibles tridentate; maxillary and labial palpi 2 and 1-segmented respectively.

Antennae (fig. L).- Yellow, 5-segmented; scape cylindrical, five times as long as wide (0.10:0.02 mm); pedicel two and a half times as long as wide; funicle 2-segmented; first

funicle segment wider than long, shorter than second; second quadrate; club spatulate, six times as long as wide (0.18:0.03 mm).

Thorax.- Orange yellow; pronotum formed of two pieces with membranous area in middle, anterior margin V-shaped, posterior margin straight with 5 pairs of setae; scutum with 2 setae near each parapsidal furrow; scutellum with 4 setae; mesopostphragma well developed, longer than the length of mesonotum.

Fore wings (fig. M).- Hyaline, slightly more than three times as long as wide (0.40:0.12 mm); costal cell narrow, longer than marginal vein; submarginal vein with 3 setae and 9 bullae; marginal vein longer than stigmal vein and with 3 setae; postmarginal vein absent; marginal fringe slightly more than two-third the greatest wing width; speculum bordered by two rows of setae proximally.

Hind wings.- Hyaline, six times as long as wide; marginal fringe length more than the greatest wing width.

Legs.- Yellow; tarsi 4-jointed; middle tibial spur about one-half the length of basitarsus (fig. N).

Abdomen.- Orange yellow, longer than thorax; ovipositor slightly exserted, arising from basal one-third of abdominal venter; first valvifers semicircular with basal and apical angles at different levels; second valvifers long and of uniform width,

PLATE 21

Figs. A-K. Eretmocerus aligarhensis sp. n.

A. Mandible, ♀

B. Maxillary and labial palpi, ♀

C. Antenna, ♀

D. Pronotum, ♀

E. Part of thorax in dorsal view, ♀

F. Fore wing, ♀

G. Part of middle leg, ♀

H. First valvifer, ♀

I. Second valvifer and third valvula, ♀

J. Outer plate of ovipositor, ♀

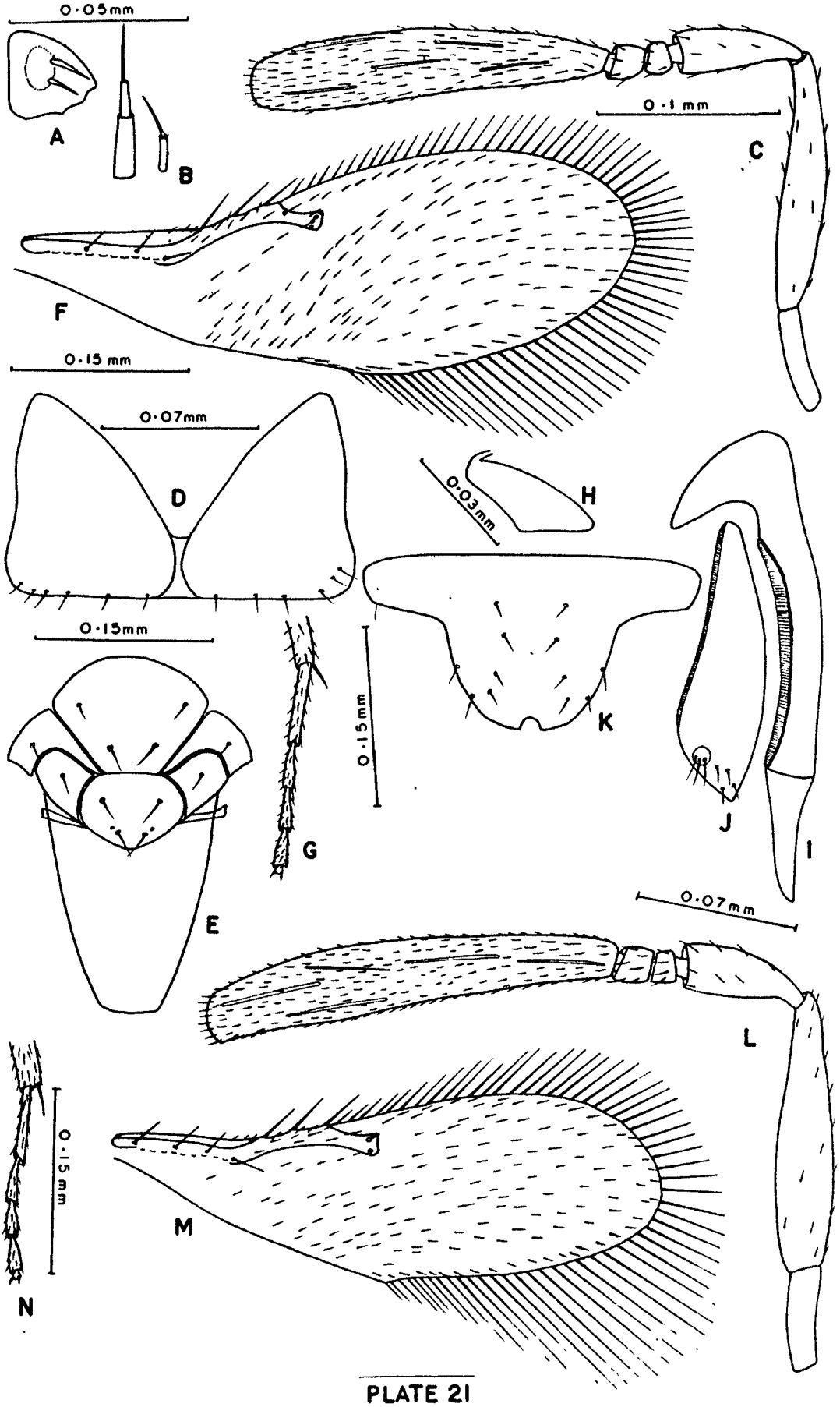
K. Subgenital plate, ♀

Figs. L-N. Eretmocerus longipilus sp. n.

L. Antenna, ♀

M. Fore wing, ♀

N. Part of middle leg, ♀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N

PLATE 21

third valvulae long, movably articulated with second valvifers; outer plates of ovipositor with a thick ridge along dorsal margin; subgenital plate with anterior margin straight, posterior margin semicircular with a notch in middle.

Female length: 0.56 mm.

Holotype ♀. INDIA: Uttar Pradesh, Aligarh ex Aleyrodes sp. on Lantana indica, 15.viii.1975 (M. Younus Khan).

Paratypes. 6 ♀ (same data as holotype).

Eretmocerus mashhoodi Hayat

(Plate 22, figs. A-H)

Eretmocerus mashhoodi Hayat, 1972, Entomophaga, 17: 102.

The characters proposed by Hayat (1972 c) for the species E. mashhoodi apply well on the species under study. Some additional specific characters are proposed which are as follows: Female. Mandibles with teeth rudimentary (fig. A); pronotum with anterior margin V-shaped, posterior margin straight with 4 pairs of small setae, antero-lateral angles obtuse (fig. C); mesopostphragma longer than meso- and metanotum together (fig. D). Male. Antennal scape four times as long as wide, pedicel one-third the length of scape, funicle absent, club 1-segmented and nine and a half times as long as wide (fig. G); male genitalia

long, gonobase shorter than aedeagus, digitus long without projections (fig. H).

Material examined.- 10 ♀, 5 ♂, INDIA: Uttar Pradesh, Aligarh, Exhibition ground, ex Neomaskellia bergii on Saccharum sp., 12.xi.1975 (M. Younus Khan).

Eretmocerus paulistis Hempel

(Plate 22, figs. I-L)

Eretmocerus paulistis Hempel, 1904, Boll. Agri. Sao. Paulo. Brizil, Ser., 5: 19.

Eretmocerus paulistis Hempel; Compere, 1936, Univ. Calif. Publ. Ent., 6: 321.

Eretmocerus paulistis Hempel; De Santis, 1948, Rev. Mus. La Plata (N.S.) 5 (Zool.): 155.

Material examined.- 1 ♀, INDIA: Uttar Pradesh, Aligarh, Exhibition ground, ex Neomaskellia bergii on Saccharum sp., 12.xi.1975 (M. Younus Khan).

This species is reported for the first time from India.

PLATE 22

Figs. A-H. Eretmocerus mashhoodi Hayat

A. Mandible, ♀

B. Antenna, ♀

C. Pronotum, ♀

D. Part of thorax in dorsal view, ♀

E. Fore wing, ♀

F. Part of middle leg, ♀

G. Antenna, ♂

H. Genitalia, ♂

Figs. I-L. Eretmocerus paulistis Hempel

I. Antenna, ♀

J. Propodeum and part of thorax in dorsal view, ♀

K. Fore wing, ♀

L. Part of middle leg, ♀

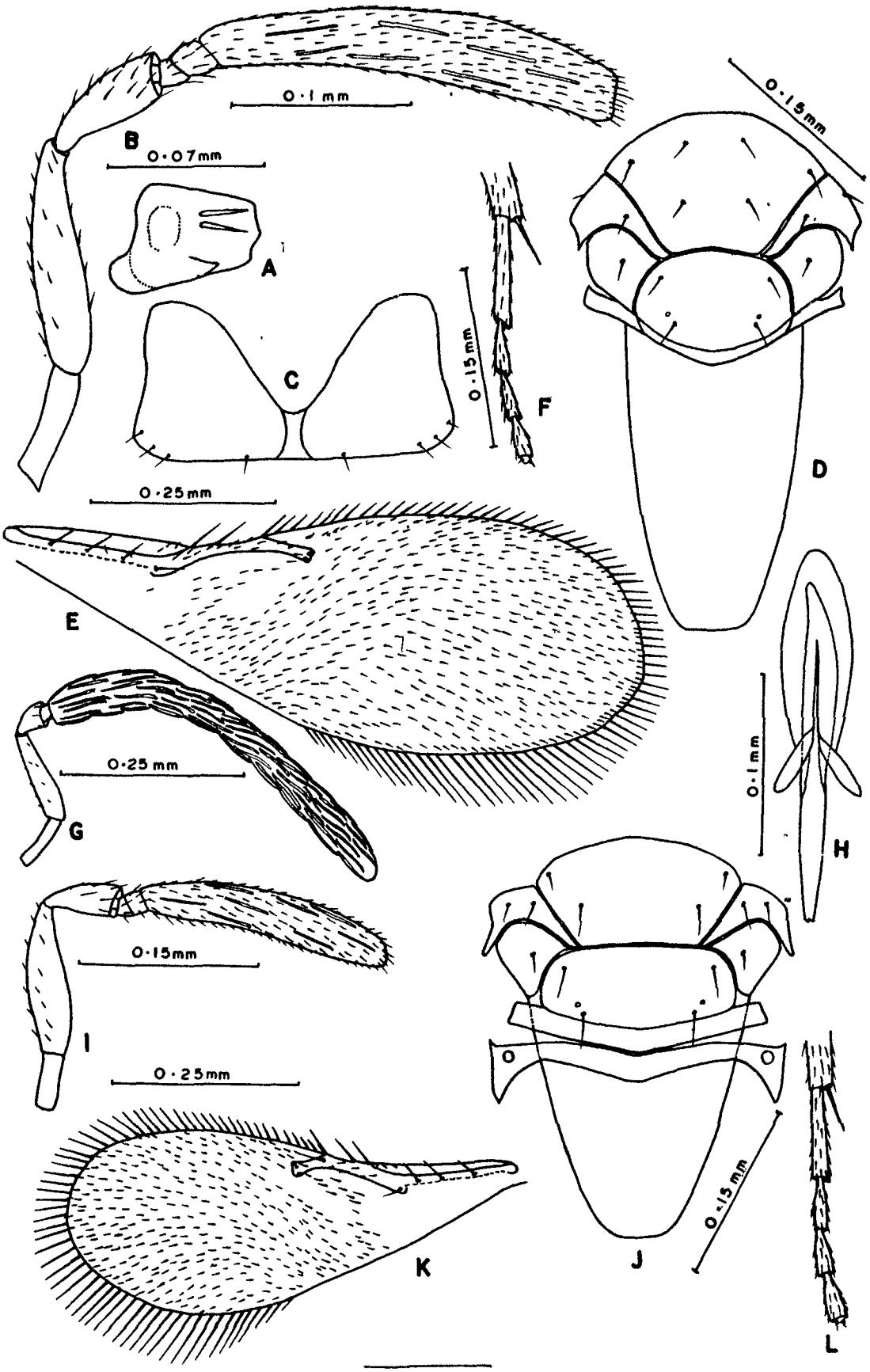
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PLATE 22

SUBFAMILY: PTEROPTRICINAE ASHMEAD

Ashmead (1904 a) proposed the tribe Pteroptricini in the subfamily Aphelininae for the genera having 4-jointed tarsi. Later, this was followed by Howard (1907), Girault (1915) and Mani (1938). Mercet (1930) raised the tribe Pteroptricini to the subfamily rank Pteroptricinae and shifted the genus Cales Howard from it to his newly proposed subfamily Calesinae. De Santis (1946, 1948) and Nikol'skaya and Yasnosh (1966) uphold Mercet (1930) in placing the genus Cales in the subfamily Calesinae. Further, they dropped the subfamily Pteroptricinae from Aphelinidae and distributed its genera among other subfamilies. Erdös (1964) and Ferrière (1965) revalidated the subfamily Pteroptricinae. Further, they dropped the subfamily Calesinae and reshifted the genus Cales to the subfamily Pteroptricinae. Recently, Shafee and Khan (1978) followed Ferrière (1965) in placing the genera having 4-jointed tarsi in the subfamily Pteroptricinae. However, they shifted the genus Eretmocerus Haldeman from Pteroptricinae to their newly proposed subfamily Eretmocerinae. Further, they assigned the characters i.e. 4-jointed tarsi and absence of speculum in the fore wings for the subfamily pteroptricinae.

KEY TO SOME GENERA OF THE SUBFAMILY PTEROPTRICINAE

1. Antennae 7 or 8-segmented. 2

__ Antennae 6-segmented; funicle 1-segmented, club 3-segmented. . . . . Artas Howard

2. Antennae 7-segmented. 3

__ Antennae 8-segmented. 4

3. Funicle 2-segmented, club 3-segmented; wings normal. . . . . .Pteroptrix Westwood

__ Funicle 4-segmented, club 1-segmented; wings rudimentary . . . . . Tetracyclos Kryger

4. Body normal, not flattened; stigmal vein well developed. . . . . .Archenomus Howard

__ Body much flattened; stigmal vein rudimentary. . . . . Aphelosoma Nikol'skaya

SUBFAMILY: APHELININAE HOWARD

Ashmead (1904 a), Howard (1907), Mercet (1912), Girault (1915) and Mani (1938) placed the genera having 5-jointed tarsi in the tribe Aphelinini. De Santis (1946, 1948) and Nikol'skaya and Yasnosh (1966) did not emphasized on the number of tarsal joints, instead they allocated the genera having fore wings with speculum to the subfamily Aphelininae. Ferrière (1965) assigned only those genera to the subfamily Aphelininae, as having 5-jointed tarsi and presence of speculum in fore wings. Recently, Shafee and Khan (1978) accepted Ferrière (1965) in placing the genera having 5-jointed tarsi and presence of speculum in fore

wings in the subfamily Aphelininae. Further, they split the subfamily Aphelininae into two tribes: Aphelinini and Mariettini, on the basis of presence or absence of membranous area in mid of pronotum. This character, as matter of fact, was regarded as new generic character by Alam (1956), Agarwal (1964 b), Nikol'skaya and Yasnosh (1966) and Hayat (1971 b, 1972 a, b & 1974 b).

KEY TO TRIBES AND GENERA OF THE SUBFAMILY APHELININAE

1. Pronotum formed of two separate pieces and with a membranous area in middle. . . . . APHELININI Thomson. 2
   Aphelinus Dalman (Pl. 23, fig. D; Nikol'skaya & Yasnosh, 1966, fig. 172; Hayat, 1972 a, fig. 9); Aphytis Howard (Pl. 25, fig. E); Centrodora Foerster (Pl. 26, fig. D; Nikol'skaya & Yasnosh, 1966, fig. 151; Anneoke, 1965, fig. 1); Marlattiella Howard (Hayat, 1974 b); Syrdiella Shafee (1970).

__ Pronotum formed of one piece and without membranous area in middle. . . . . MARIETTINI Shafee & Khan. 6
   Marietta Motschulsky (Pl. 27, fig. E; Agarwal, 1964 b, fig. 28; Nikol'skaya & Yasnosh, 1966, fig. 164); Eriaphytis Hayat (Pl. 28, fig. D; Hayat, 1972 b, fig.2).

2. Antennae 5 or 6-segmented. 3

__ Antennae 4-segmented; funicle and club each 1-segmented;

marginal vein longer than submarginal vein; postmarginal vein absent. . . . . Marlattiella Howard

3. Antennae 6-segmented. 4

__ Antennae 5-segmented; fore wings hyaline with an obscure patch below stigmal vein and group of conspicuous setae on middle of mesal margin of speculum; mesonotum with 4 longitudinal black bands; abdominal dorsum with 5 black transverse bands. . . . . Syediella Shafee

4. Last sternite (subgenital plate) reaches to mid of abdominal venter; ovipositor uncovered and straight; general body colour yellow; subgenital plate with posterior margin straight and without antero-lateral apodemes (Pl. 26, fig. L); parasites of eggs and coccids. 5

__ Last sternite (subgenital plate) reaches to apex of abdominal venter, covering the ovipositor, except apex which curved upward; general body colour black; subgenital plate V-shaped with greatly reduced posterior margin, antero-lateral apodemes distinct (Pl. 23, fig. N); first valvifers semicircular (Pl. 23, fig. K); parasites of aphids. . . . . .Aphelinus Dalman

5. Body generally elongated; fore wings long and narrow; club uncurved apically; ovipositor not prominent; pronotum with anterior margin slightly concave in middle, postero-lateral ridges absent (Pl. 25, fig. E); parasites of coccids. . . . . .Aphytis Howard

__ Body generally not elongated; fore wings broad; club slightly curved apically; ovipositor generally more or less prominent; pronotum with anterior margin deeply concave in middle, postero-lateral ridges present (Pl. 26, fig. D); parasites of eggs. . . .Centrodora Foerster

6. Antennae 6-segmented in female, 5-segmented in males; club 1-segmented; fore wings with hyaline spots or bands of transparent setae (Pl. 27, fig. F) or body with pronounced white spots or maculations most frequently with both; stigmal vein short (Pl. 27, fig. G); first valvifers semicircular (Pl. 27, fig. K; Agarwal, 1964 b, fig. 30); subgenital plate with anterior margin slightly prolonged in middle (Pl. 27, fig. N). . . . . Marietta Motschulsky

__ Antennae 7-segmented; club 2-segmented; fore wings or body without spots (Pl. 28, fig. F); stigmal vein well developed (Pl. 28, fig. G); first valvifers almost triangular (Pl. 28, fig. K; Hayat, 1972 b, fig. 4); subgenital plate with anterior margin straight (Pl. 28, fig. N; Hayat, 1972 b, fig. 3). . . . . Eriaphytis Hayat

TRIBE : APHELININI THOMSON

The tribal characters viz. "Pronotum formed of two separate pieces and with a membranous area in middle" proposed by Shafee and Khan (1978) are confirmed as stable and apply well on the genera: Aphelinus Dalman (Pl. 23, fig. D; Nikol'skaya & Yasnosh, 1966, fig. 172; Hayat, 1972 a, fig. 9); Aphytis Howard (Pl. 25, fig. E); Centrodora Foerster (Pl. 26, fig. D; Nikol'skaya & Yasnosh, 1966, fig. 151; Annecke, 1965, fig. 1); Marlattiella Howard (Hayat, 1974 b) and Syediella Shafee (1970).

2. Genus Aphelinus Dalman

Aphelinus Dalman, 1820, Handl. K. Svensk. VetenskAkad., 21: 181.

Type-species: Entedon abdominalis Dalman (Monobasic).

Agonioneurus Westwood, 1833, Mag. Nat. Hist., 6: 122.

Type-species: Agonioneurus basalis Westwood (Monobasic).

Myina Nees, 1834, Ichneum. Affin. Monog., 2: 189.

Type-species: Myina abdominalis Nees.

Eriophilus Haldeman, 1851, Pa. Farm Jour., 1: 130.

Type-species: Eriophilus mali Haldeman (Monobasic).

The genus Aphelinus was proposed by Dalman (1820) for the species Entedon abdominalis Dalman. The species belonging

to this genus are generally parasites of aphids. The distinguishing characters of this genus have been given in detail by De Santis (1948), Nikol'skaya (1952), Peck et al. (1964) and Nikol'skaya and Yasnosh (1966). The present writer suggested some new generic characters which are as follows: Pronotum formed of two separate pieces and with a membranous area in middle, anterior margin deeply concave, posterior margin straight (Pl. 23, fig. D; Nikol'skaya & Yasnosh, 1966, fig. 172); first valvifers semicircular (Pl. 23, fig. K); second valvifers long and narrow, more or less of uniform width, third valvulae long, movably articulated with second valvifers (Pl. 23, fig. L; Nikol'skaya & Yasnosh, 1966, fig. 175); subgenital plate V-shaped with greatly reduced posterior margin, antero-lateral apodemes distinct (Pl. 23, fig. N); male genitalia with gonobase slightly shorter than aedeagus, digitus short each with two projections (Pl. 23, fig. O; Nikol'skaya & Yasnosh, 1966, fig. 177).

Aphelinus mali (Haldeman)

(Plate 23, figs. A-O)

Eriophilus mali Haldeman, 1851, Pa. Farm Jour., 1: 131.

Aphelinus mali (Haldeman); Howard, 1881, Ann. Rpt. U.S. Dept. Agr. (1880): 356.

Aphelinus mali (Haldeman); Nikol'skaya & Yasnosh, 1966, Opred. Faune SSSR., 91: 167.

PLATE 23

Figs. A-O. *Aphelinus mali* (Haldeman)

A. Mandible, ♀

B. Maxillary and labial palpi, ♀

C. Antenna, ♀

D. Pronotum, ♀

E. Propodeum and part of thorax in dorsal view, ♀

F. Fore wing, ♀

G. Part of fore wing venation, ♀

H. Fore leg, ♀

I. Middle leg, ♀

J. Hind leg, ♀

K. First valvifer, ♀

L. Second valvifer and third valvula, ♀

M. Outer plate of ovipositor, ♀

N. Subgenital plate, ♀

O. Genitalia, ♂

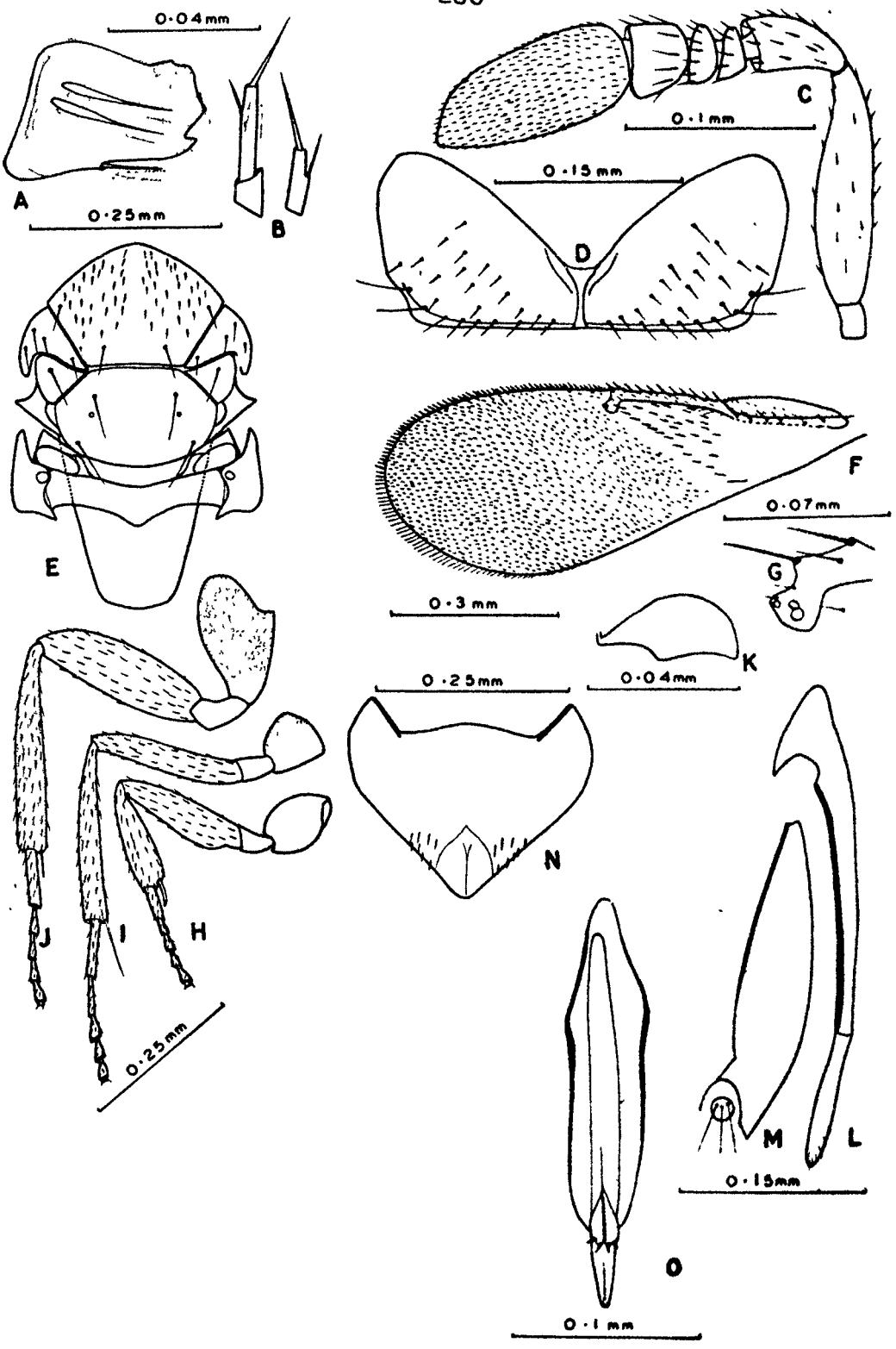
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PLATE 23

Aphelinus mali (Haldeman): Hayat, 1972, Entomophaga, 17: 50.

The present writer suggested some additional specific characters which are as follows: Female. Pronotum formed of two separate pieces and with a membranous area in middle, anterior margin concave, posterior margin straight with a submarginal ridge bearing 8 pairs of setae (fig. D); first valvifers semicircular with basal and apical angles in one plane (fig. K); anterior margin of basal part of second valvifers V- shaped, third valvulae seven times as long as wide, slightly more than one-third the length of second valvifers (fig. L). Male. Male genitalia long, gonobase slightly shorter than aedeagus; each digitus with two projections (fig. O).

Material examined.- 5 ♀, 2 ♂, INDIA: Uttar Pradesh, Aligarh, ex aphid on Saccharum officinarum Linn., 13.xi.1975 (M. Younus Khan).

Aphelinus desantisi Hayat

(Plate 24, figs. A-F)

Aphelinus desantisi Hayat, 1972, Entomophaga, 17: 52.

Material examined.- 2 ♀. INDIA: Uttar Pradesh, Aligarh, ex aphid, on Saccharum officinarum Linn., 13.xi.1975 (M. Younus Khan).

Aphelinus flavipes (Foerster)

(Plate 24, figs. G-M)

Aphelinus flavipes (Foerster): Hayat, 1972, Entomophaga, 17: 52.

Material examined.- 1 ♀, INDIA: Uttar Pradesh, Aligarh, ex aphid on Saccharum officinarum Linn., 13.xi.1975 (M. Younus Khan).

3. Genus Syrediella Shafee

Syrediella Shafee, 1970, Mushi, 43: 144.
Type-species: Syrediella maculata Shafee (Monobasic).

The genus Syrediella was proposed by Shafee (1970) for the species S. maculata Shafee. The distinguishing characters of this genus have been given by Shafee (1970).

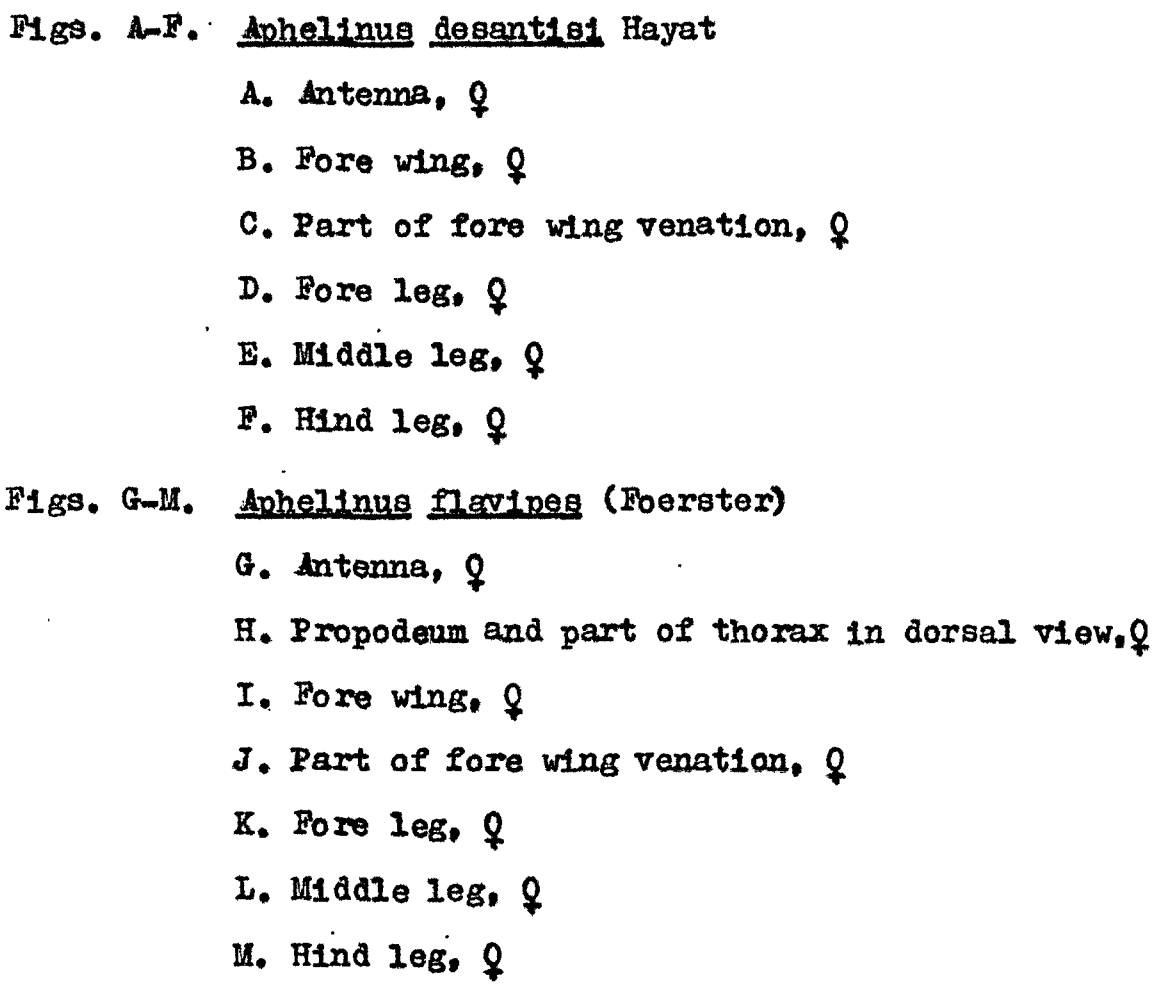
Syrediella maculata Shafee

(Plate 25, figs. A-C)

Syrediella maculata Shafee, 1970, Mushi, 43: 145.

Material examined.- 1 ♀, INDIA: Tamil Nadu, Ootacamund, ex Mealy-bug, 24.vi.1968 (S. Adam Shafee).

PLATE 24



Figs. A-F. Aphelinus desantisi Hayat

A. Antenna, ♀

B. Fore wing, ♀

C. Part of fore wing venation, ♀

D. Fore leg, ♀

E. Middle leg, ♀

F. Hind leg, ♀

Figs. G-M. Aphelinus flavipes (Foerster)

G. Antenna, ♀

H. Propodeum and part of thorax in dorsal view, ♀

I. Fore wing, ♀

J. Part of fore wing venation, ♀

K. Fore leg, ♀

L. Middle leg, ♀

M. Hind leg, ♀

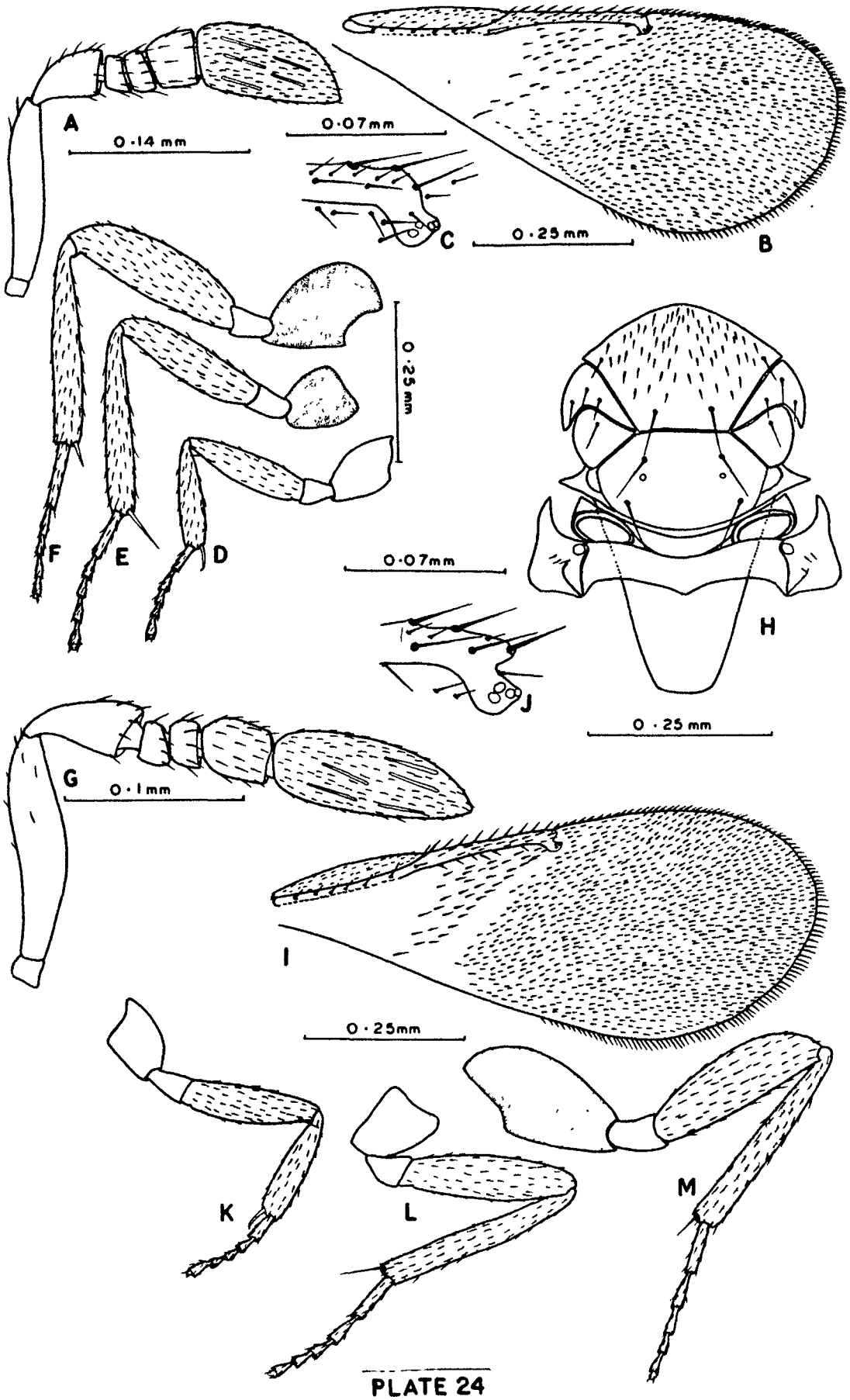

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PLATE 24

4. Genus Aphytis Howard

Aphytis Howard, 1900, Canad. Ent., 32: 168.

Type-species: Aphytis chilensis Howard (Monobasic).

Prospaphelinus De Gregorio, 1914, Ann. Agr. Siciliana, 3: 406.

Type-species: Prospaphelinus silvestrii De Gregorio (Monobasic).

The genus Aphytis was proposed by Howard (1900) for the species A. chilensis Howard. The distinguishing characters of this genus have been given by Compere (1955), Azim (1963) and Quednau (1964). The present writer suggested a new generic character which is as follows: Pronotum formed of two pieces and with a membranous area in middle, anterior margin slightly concave in middle (Pl. 25, fig. E).

Aphytis alami Agarwal

(Plate 25, figs. D-I)

Aphytis alami Agarwal, 1964, Proc. Indian Acad. Sci., 60: 316.

Material examined.- 2 ♀. INDIA: Uttar Pradesh, Aligarh, ex Coccid on Weed plant, 10.ix.1976 (M. Younus Khan).

5. Genus Centrodora Foerster

Centrodora Foerster, 1878, Verhandl. Naturhist. Ver. Preuss. Rheinl. u. Westfalens, 35: 66.

PLATE 25

Figs. A-C. Syediella maculata Shafee

A. Antenna, ♀

B. Propodeum and part of thorax in dorsal view, ♀

C. Fore wing, ♀

Figs. D-I. Aphytis alami Agarwal

D. Mandible, ♀

E. Pronotum, ♀

F. Fore wing, ♀

G. First valvifer, ♀

H. Second valvifer and third valvula, ♀

I. Outer plate of ovipositor, ♀

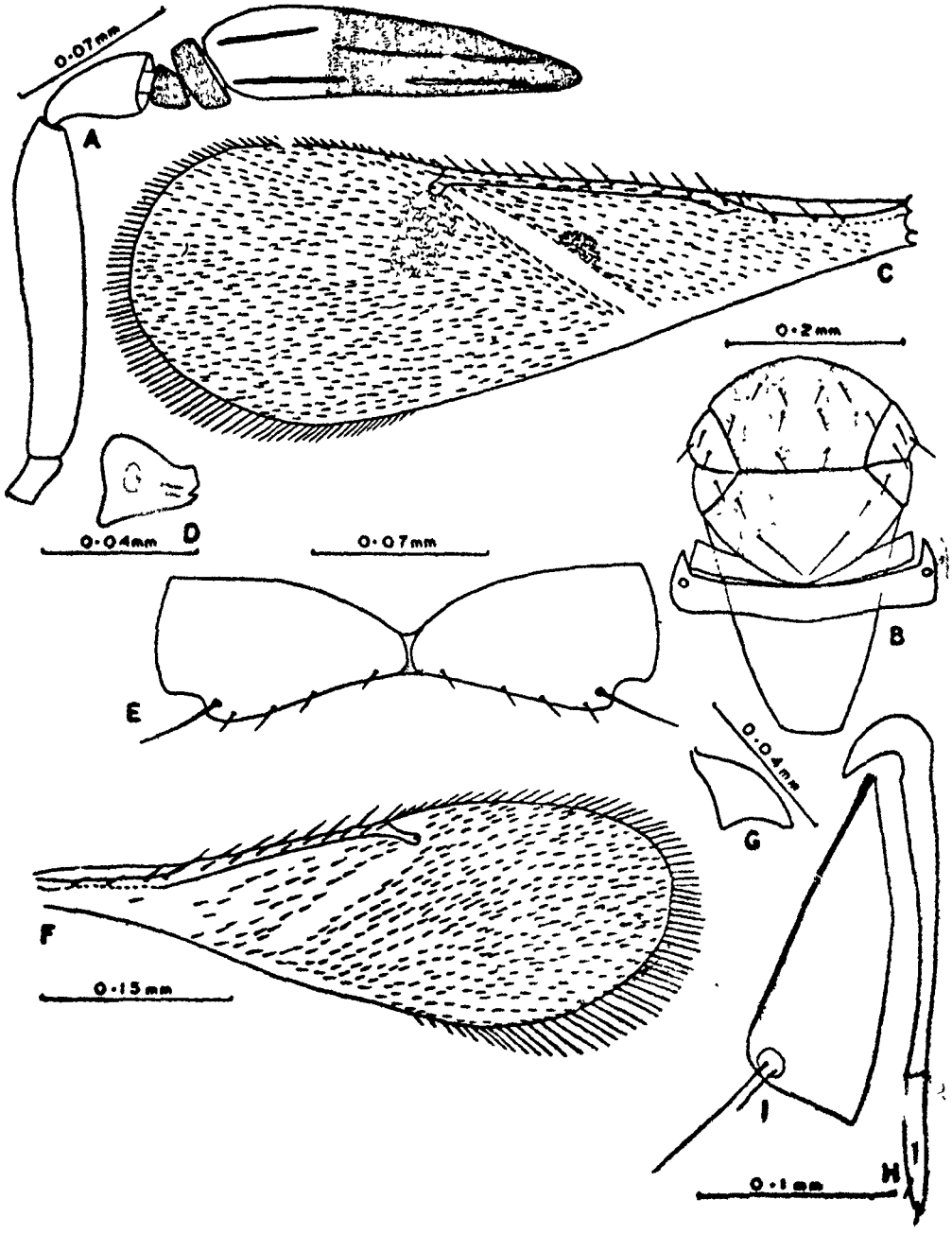

PLATE 25

Type-species: Centrodora amoena Foerster (Monobasic).

Paraphelinus Perkins, 1906, Bull. Hawaii Sugar Planters' Assoc. Expt. Sta. Div. Ent., 1: 264.

Type-species: Paraphelinus xiphidii Perkins (Monobasic).

The genus Centrodora was proposed by Foerster (1878) for the species Centrodora amoena Foerster. The species belonging to this genus are generally parasites on eggs of insects. The distinguishing characters of this genus have been given by Nikol'skaya (1952), Compere (1955) and Nikol'skaya and Yasnosh (1966). The present writer suggested some new generic characters which may further help in distinguishing Centrodora from its close allies. These are: Pronotum formed of two separate pieces and with a membranous area in middle, anterior margin deeply concave in middle, posterolateral ridges distinct (Pl. 26, fig. D); first valvifers semicircular with basal and apical angles at different levels (Pl. 26, fig. I); second valvifers long and narrow, more or less of uniform width, third valvulae long, movably articulated with second valvifers (Pl. 26, fig. J; Nikol'skaya & Yasnosh, 1966, fig. 161); outer plates of ovipositor narrow at base, broadly truncated at apex (Pl. 26, fig. K); subgenital plate more or less of uniform width, posterior margin straight with a notch in middle (Pl. 26, fig. L); male genitalia with gonobase shorter than aedeagus, digitus well developed, each with

2 long projections (Pl. 26, figs. N & S; Annecke, 1965, fig. 6; Nikol'skaya & Yasnosh, 1966, fig. 155).

Key to Indian species of *Centrodora* Foerster, based on females

1. Submarginal vein slightly longer than marginal vein; marginal vein with 7 setae; antennal scape 4-5 times as long as wide; pedicel about one-half the length of scape. 2

__ Submarginal vein much shorter than marginal vein; marginal vein with 14 setae (Kaul & Saraswat, 1974, fig. 1 A); antennal scape 7 times as long as wide; pedicel less than one-half the length of scape; club more than three times as long as wide. . . . . .*C. chowdhurii* Kaul

2. Width of frontovertex at narrowest more than one-third head width; scape four times as long as wide; pedicel slightly less than two times as long as wide; club two and a half times as long as wide. . . . .*C. azizi* Hayat

__ Width of frontovertex at narrowest one-third head width; scape five times as long as wide; pedicel two and a half times as long as wide; club more than two and a half times as long as wide. . . .*C. mumtazi* Hayat

Centrodora azizi Hayat

(Plate 26, figs. A-N)

Centrodora azizi Hayat, 1973, Entomophaga, 18: 41.

Some additional specific characters have been suggested which are as follows: Pronotum formed of two separate pieces and with a membranous area in middle, anterior margin slightly concave in middle, postero-lateral ridges distinct, each with 3 setae (fig. D); first valvifers semicircular with basal and apical angles at different levels (fig. I); anterior margin of basal part of second valvifers not much curved, third valvulae about six times as long as wide, slightly more than one-third the length of second valvifers (fig. J); outer plate of ovipositor narrow at base, broadly truncated at apex (fig. K); subgenital plate of uniform width, posterior margin straight with a notch in middle (fig. L); male genitalia with gonobase shorter than aedeagus, digitus well developed with two projections (fig. N).

Material examined.- 4♀, 3♂, INDIA: Andhra Pradesh, Guntur, ex eggs of Oxyrachis tarandus Fabr. on Acacia sp., 14.1.1976 (M. Younus Khan).

Centrodora mumtazi Hayat

(Plate 26, figs. O-S)

Centrodora mumtazi Hayat, 1973, Entomophaga, 18: 44.

PLATE 26

Figs. A-N. Centrodora azizi Hayat

A. Mandible, ♀

B. Maxillary and labial palpi, ♀

C. Antenna, ♀

D. Pronotum, ♀

E. Part of thorax in dorsal view, ♀

F. Fore wing, ♀

G. Part of fore wing venation, ♀

H. Part of middle leg, ♀

I. First valvifer, ♀

J. Second valvifer and third valvula, ♀

K. Outer plate of ovipositor, ♀

L. Subgenital plate, ♀

M. Antenna, ♂

N. Genitalia, ♂

Figs. O-S. Centrodora mumtazi Hayat

O. Antenna, ♀

P. Fore wing venation, ♀

Q. Part of fore wing venation, ♀

R. Antenna, ♂

S. Genitalia, ♂

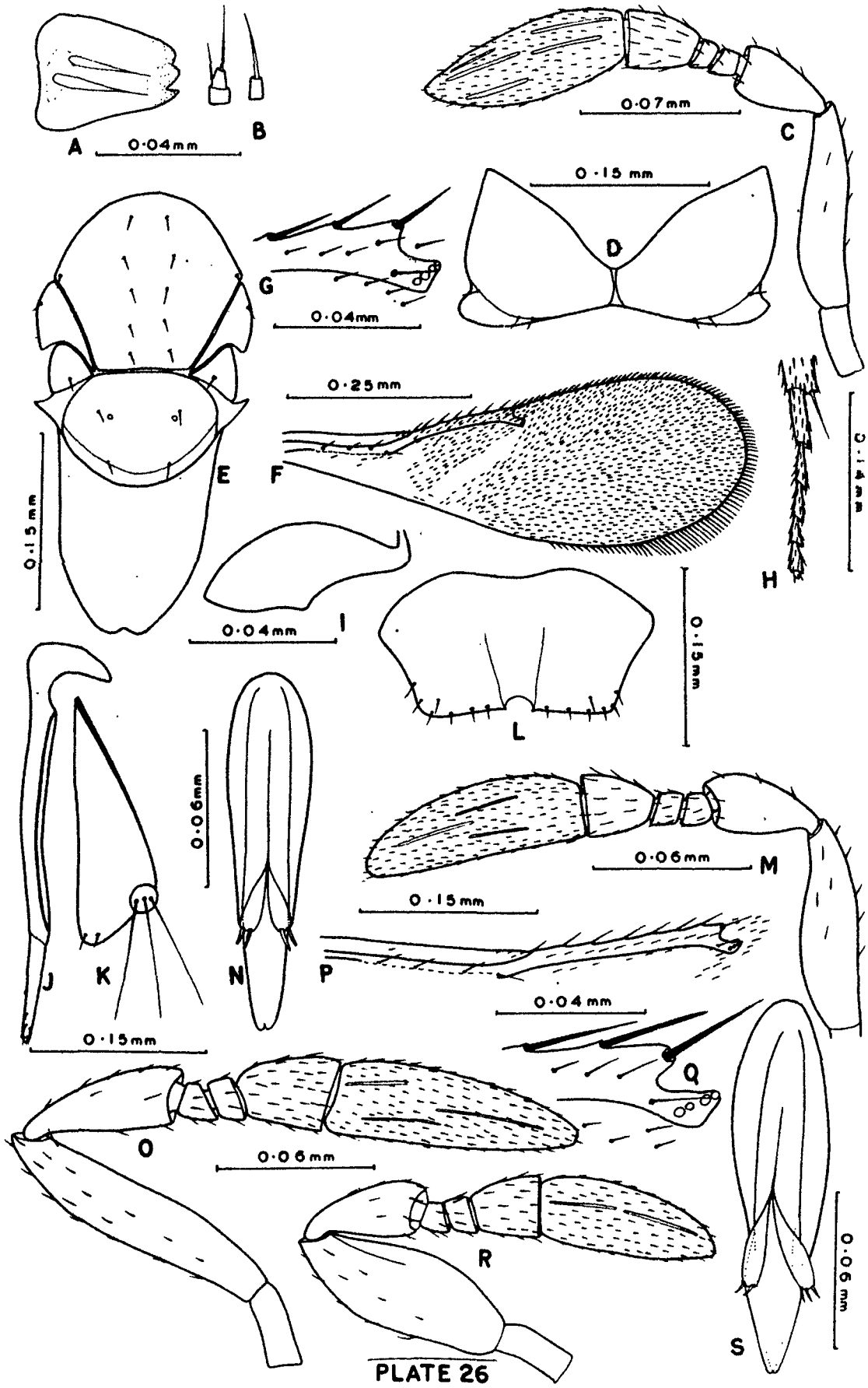
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PLATE 26

Material examined.- 5 ♀, 5 ♂, INDIA: Uttar Pradesh, Aligarh, ex eggs of Oxyrachis tarandus Fabr. on Acacia sp., 18.ix.1974 (M. Younus Khan).

TRIBE: MARIETTINI SHAFEE AND KHAN

The tribal characters viz. "Pronotum formed of one piece and absence of membranous area in middle" proposed by Shafee and Khan (1978) are confirmed as stable and apply well on the genera: Marietta Motschulsky (Pl. 27, fig. E; Agarwal, 1964 b, fig. 28; Nikol'skaya & Yasnosh, 1966, fig. 164) and Eriaphytis Hayat (Pl. 28, fig. D; Hayat, 1972 b, fig. 2).

6. Genus Marietta Motschulsky

Marietta Motschulsky, 1863, Bul. Soc. Imp. Nat. Moscou, 36: 51.
Type-species: Marietta leopardina Motschulsky (Monobasic).
Perissopterus Howard, 1895, Tech. Ser. U.S. Dept. Agr., Div. Ent., 1: 20.
Type-species: Aphelinus pulchellus Howard.
Pseudaphelinus Brèthes, 1918, An. Soc. Rur. Argentina, 53: 157.
Type-species: Pseudaphelinus caridei Brèthes (Monobasic).
Paraphytis Compere, 1925, Trans. Amer. Ent. Soc., 51: 129.
Type-species: Paraphytis vittata Compere (Monobasic).

The genus Marietta was proposed by Motschulsky (1863) for the species Marietta leopardina Motschulsky. Girault (1916 d), Compere (1936) and De Santis (1946) independently declared the genera Perissopterus Howard, Paraphytis Compere, and Pseudaphelinus Brèthes respectively as synonyms of Marietta Motschulsky. Some new generic characters are suggested viz., pronotum formed of one piece and without membranous area in middle, anterior margin V-shaped, posterior margin slightly curved (Pl. 27, fig. E; Agarwal, 1964 b, fig. 28; Nikol'skaya & Yasnosh, 1966, fig. 164); first valvifers semicircular with basal and apical angles at different levels (Pl. 27, fig. K; Agarwal, 1964 b, fig. 30); second valvifers long, more or less of uniform width, third valvulae long, movably articulated with second valvifers (Pl. 27, fig. L; Agarwal, 1964 b, fig. 31; Nikol'skaya & Yasnosh, 1966, fig. 167); subgenital plate with anterior margin slightly prolonged in middle (Pl. 27, fig. N); male genitalia with gonobase longer than aedeagus, digitus well developed, each with two projections (Pl. 27, fig. P; Nikol'skaya & Yasnosh, 1966, fig. 168).

Marietta javensis (Howard)

(Plate 27, figs. A-P)

Perissopterus javensis Howard, 1907, Tech. Ser. U.S. Dept. Agri., Bur. Ent., 12: 88.

Marietta javensis (Howard); Ferrière, 1935, Bull. ent. Res., 26: 404.

PLATE 27

Figs. A-P. *Marietta javensis* (Howard)

A. Mandible, ♀

B. Maxillary and labial palpi, ♀

C. Antenna, ♀

D. Propodeum and part of thorax in dorsal view, ♀

E. Pronotum, ♀

F. Fore wing, ♀

G. Part of fore wing venation, ♀

H. Part of fore leg, ♀

I. Part of Middle leg, ♀

J. Part of hind leg, ♀

K. First valvifer, ♀

L. Second valvifer and third valvula, ♀

M. Outer plate of ovipositor, ♀

N. Subgenital plate, ♀

O. Antenna, ♂

P. Genitalia, ♂

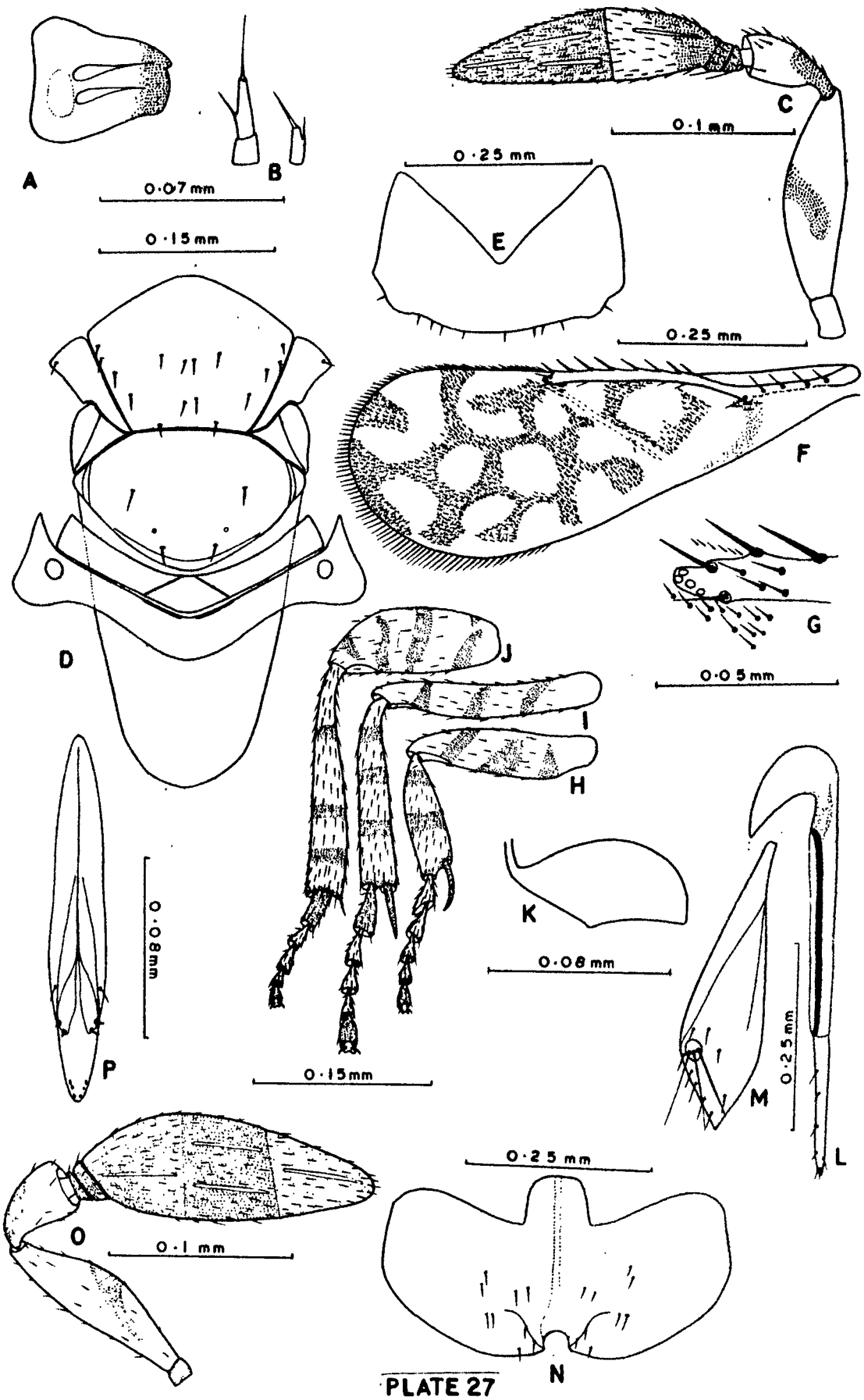
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PLATE 27

Marietta javensis (Howard): Agarwal, 1964, Proc. Indian Acad. Sci., 60: 332.

Marietta javensis (Howard): Hayat, 1974, J. nat. Hist., 8: 179.

Marietta exitiosa Compere: Hayat, 1974, J. nat. Hist., 8: 179.

Marietta harbrolepidis Ghesquière: Hayat, 1974, J. nat. Hist., 8: 179.

Material examined.- 10 ♀, 5 ♂, INDIA: Uttar Pradesh, Aligarh, ex Cerococcus hibisci (Green) on Hibiscus rosa-sinensis Linn., 8.ix.1974 (M. Younus Khan).

7. Genus Eriaphytis Hayat

Eriaphytis Hayat, 1972, Pol. Pismo Ent., 42: 151-156.

Type-species: Eriaphytis orientalis Hayat (Monobasic).

The genus Eriaphytis was proposed by Hayat (1972 b) for the species Eriaphytis orientalis Hayat, reared from Cerococcus hibisci Green infesting Hibiscus rosa-sinensis L. The genus is characterized for having pronotum with anterior margin concave, posterior margin slightly convex, antero-lateral angles acute (Pl. 28, fig. D; Hayat, 1972 b, fig. 2); first valvifers almost triangular with basal and apical angles at different levels (Pl. 28, fig. K; Hayat, 1972 b, fig. 4); second valvifers long, more or less of uniform width, third valvulae long and movably articulated with second valvifers

(Pl. 28, fig. L; Hayat, 1972 b, fig.4); outer plates of ovipositor narrow at base, broadly truncated at apex (Pl. 28, fig. M; Hayat, 1972 b, fig. 4); subgenital plate with anterior margin straight, posterior margin with small semicircular notch in middle (Pl. 28, fig. N; Hayat, 1972 b, fig. 3).

Eriaphytis orientalis Hayat

(Plate 28, figs. A-N)

Eriaphytis orientalis Hayat, 1972, Pol. Pismo Ent., 42: 153.

Material examined.- 10 ♀, INDIA: Uttar Pradesh, Aligarh, ex Cerococcus hibisci Green on Hibiscus rosa-sinensis Linn., 10.ix.1975 (M. Younus Khan).

PLATE 28

Figs. A-N. *Eriaphytis orientalis* Hayat

A. Mandible, ♀

B. Maxillary and labial palpi, ♀

C. Antennae, ♀

D. Pronotum, ♀

E. Propodeum and part of thorax in dorsal view, ♀

F. Fore wing, ♀

G. Part of fore wing venation, ♀

H. Part of fore leg, ♀

I. Part of middle leg, ♀

J. Part of hind leg, ♀

K. First valvifer, ♀

L. Second valvifer and third valvula, ♀

M. Outer plate of ovipositor, ♀

N. Subgenital plate, ♀

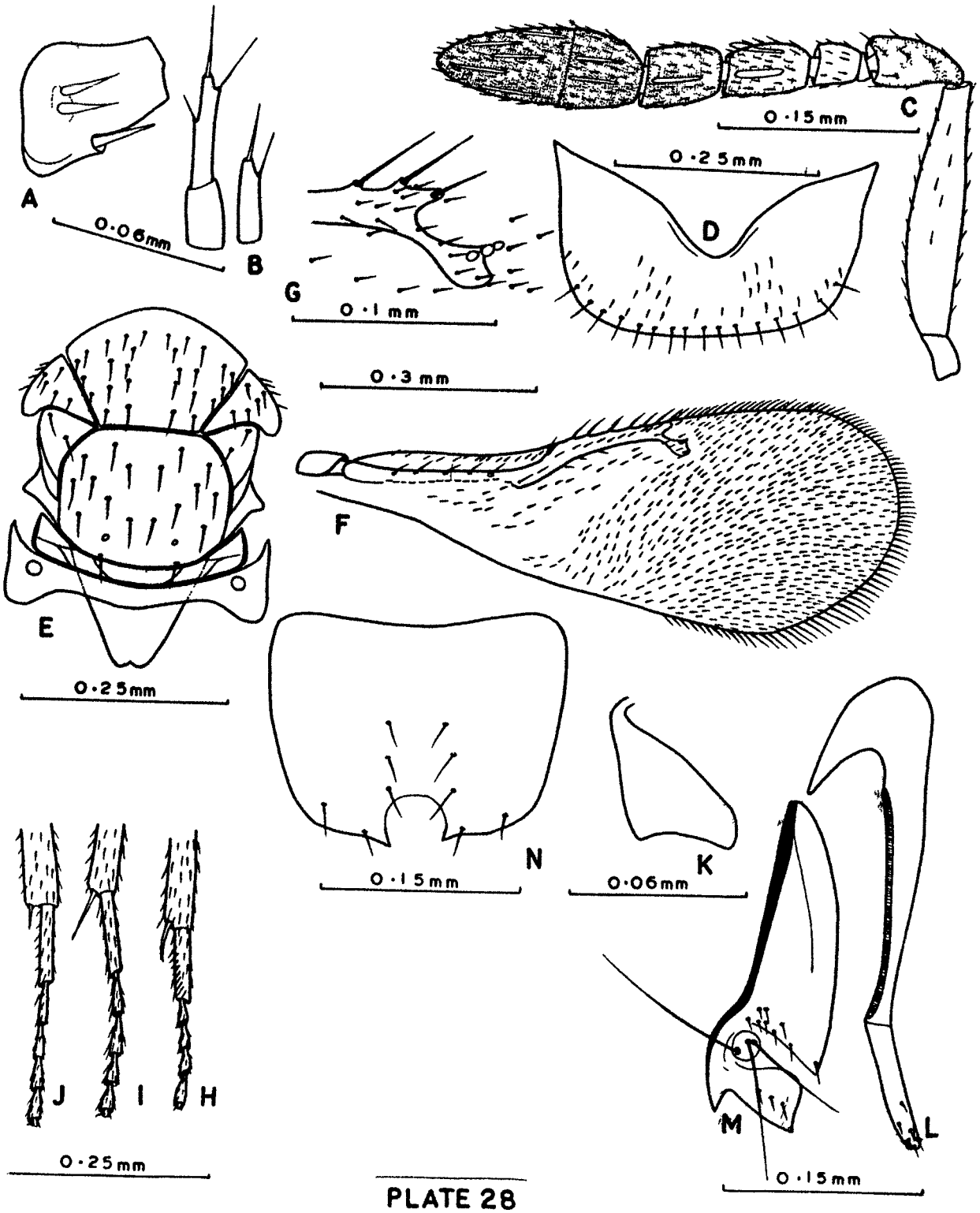
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PLATE 28

SUBFAMILY: COCCOPHAGINAE FOERSTER

De Santis (1946) demoted the family Coccophagoidae Foerster to the rank of subfamily Coccophaginae and attributed the genera to it having fore wings without a speculum. Ferrière (1965) assigned only those genera to the subfamily Coccophaginae as having 5-jointed tarsi and fore wings without speculum. Nikol'skaya and Yasnosh (1966) allocated the genera having fore wings without speculum to the subfamilies Coccophaginae, Azotinae and Prospaltellinae. Recently, Shafee and Khan (1978) accepted Ferrière (1965) in retaining only those genera in the subfamily Coccophaginae as having 5-jointed tarsi and absence of speculum in fore wings. Further, they split the subfamily Coccophaginae into two tribes; Coccophagini and Prospaltellini on the basis of presence or absence of membranous area in middle of pronotum. They demoted the subfamily Prospaltellinae Nikol'skaya and Yasnosh to the rank of tribe Prospaltellini and dropped the subfamily Azotinae Nikol'skaya and Yasnosh from Aphelinidae.

KEY TO TRIBES AND GENERA OF THE SUBFAMILY COCCOPHAGINAE

1. Pronotum formed of one continuous piece and without membranous area in middle . . .COCCOPHAGINI Foerster. 2
   <u>Coccophagus</u> Westwood (Pl. 29, figs. D & N; Pl. 30, figs. F & K; Pl. 31, figs. C & K; Pl. 32, fig. C; Pl. 33, fig. D; Pl. 34, fig. C; Alam, 1956, fig. 10; Zinna,

1961, Pl. 3, fig. 2; Nikol'skaya & Yasnosh, 1966, figs. 287, 295, 300, 305, 313, 319, 324, 331, 341 & 346 ; Hayat, 1971 b, fig. 8); Aneristus Howard (Pl. 35, fig. E); Physcus Howard (Pl. 36, fig. C); Ablerus Howard (Pl. 37, fig. B; Hayat, 1974 b, fig. 12); Azotus Howard (Pl. 37, fig. I; Alam, 1956, fig. 31; Zinna, 1962, Pl. 30, fig. 2; Agarwal, 1964 b, fig. 17).

— Pronotum formed of two separate pieces and with a membranous area in middle. . . . . .PROSPALTELLINI Nikol'skaya & Yasnosh. 6

Prospaltella Ashmead (Pl. 38, figs. C & L; Nikol'skaya and Yasnosh, 1966, fig. 487); Trichaporus Foerster (Pl. 39, figs. B & O); Aspidiotiphagus Howard (Alam, 1956, fig. 2; Nikol'skaya & Yasnosh, 1966, fig. 444); Coccophagoides Girault (Nikol'skaya & Yasnosh, 1966, fig. 456; Hayat, 1974 a. fig. 2).

2. Antennae 8-segmented; club 3-segmented; posterior margin of pronotum generally straight (Pl. 29, figs. D & N; Pl. 30, figs. F & K; Pl. 31, figs. C & K; Pl. 32, fig. C; Pl. 33, fig. D; Pl. 34, fig. C; Pl. 35, fig. B; Alam, 1956, fig. 10; Nikol'skaya & Yasnosh, 1966, figs. 287, 295, 300, 305, 313, 319, 324, 331, 341 & 346; Hayat, 1971 b, fig. 8); first valvifers triangular with basal and apical angles at different levels (Pl. 29, fig. H; Pl. 31, figs. F & N; Pl. 32, fig. J; Pl. 33, fig. H; Pl. 35, fig. K; Alam, 1956, fig. 12 A;

Zinna, 1961, Pl. 7, fig. 2; Nikol'skaya & Yasnosh, 1966, fig. 20); third valvulae usually short (Pl. 29, fig. I; Pl. 31, figs. G & O; Pl. 32, fig. K; Pl. 33, fig. I; Pl. 35, fig. L); subgenital plate narrow, central notch of posterior margin without laterally directed ridges (Pl. 31, fig. Q; Pl. 32, fig. M; Pl. 33, fig. K; Pl. 35, fig. N; Hayat, 1971 b, fig. 12) . .3

__ Antennae 7-segmented; club 1 or 2-segmented; posterior margin of pronotum concave (Pl. 36, fig. C; Pl. 37, figs. B & I; Alam, 1956, fig. 31; Zinna, 1962, Pl. 30, fig. 2; Agarwal, 1964 b, fig. 17; Hayat, 1974 b, fig. 12); first valvifers usually semicircular (Pl. 37, figs. D & K; Alam, 1956, fig. 35 A; Zinna, 1962, Pl. 35, fig. 3); third valvulae usually long and narrow (Pl. 36, fig. N; Pl. 37, figs. E & L; Zinna, 1962, Pl. 35, fig. 2); subgenital plate moderately broad, central notch of posterior margin with laterally directed ridges (Pl. 36, fig. P; Pl. 37, figs. G & N; Hayat, 1974 b, fig. 15). .4

3. Funicle cylindrical; postmarginal vein usually well developed; base of mid tibiae without thick setae; fore wings hyaline. . . . . .Coccophagus Westwood

__ Funicle and club flattened; postmarginal vein rudimentary; base of mid tibiae with row of thick setae; fore wings infuscated . . . . . .Aneristus Howard

4. Funicle 4-segmented; club entire; pronotum with a

submarginal ridge along each lateral margin (Pl. 37, figs. B & I; Alam, 1956, fig. 31; Agarwal, 1964 b, fig. 17; Hayat, 1974 b, fig. 12); Ovipositor exserted; first valvifers semicircular with basal and apical angles in one plane (Pl. 37, figs. D & K; Alam, 1956, fig. 35 A; Zinna, 1962, Pl. 35, fig. 3); third valvulae long (Pl. 37, figs. E & L); anterior margin of subgenital plate conical in middle, posterior margin with a notch in middle, sides of notch followed by lateral wavy ridges, mid-longitudinal groove and antero-lateral apodemes distinct (Pl. 37, figs. G & N; Hayat, 1974 b, fig. 15). .5

__ Funicle 3-segmented; club 2-segmented; pronotum without submarginal ridges along each lateral margin (Pl. 36, fig. C); ovipositor concealed; first valvifers quadrate with basal and apical angles at different levels (Pl. 36, fig. M); third valvulae short; subgenital plate with anterior margin straight, mid-longitudinal groove and antero-lateral apodemes absent (Pl. 36, fig. P; Hayat, 1971 a, fig. 3). . . . . .*Physcus* Howard

5. Disc of fore wings without group of long and thick setae; stigmal vein long and slender. . . . *Ablerus* Howard

__ Disc of fore wings with group of long and thick setae; stigmal vein swollen. . . . . .*Azotus* Howard

6. Fore wings broad; marginal fringe shorter than one-half of wing width; with setae at radius . . . . . : .7

__ Fore wings narrow; marginal fringe long, longer than wing width, bare at radius; outer plates of ovipositor narrow in proximal region gradually broadening distally with distal end narrowly rounded, dorsal margin followed by a long, narrow submarginal ridge (Alam, 1956, fig. 6 A). . . . . .Aspidiotiphagus Howard

7. Funicle and club each 3-segmented. 8

__ Funicle and club 4 and 2-segmented respectively; posterior margin of subgenital plate with a notch in middle (Pl. 39, fig. K). . . . . Trichaporus Foerster

8. Antennal club not distinctly separated from funicle; club conical at apex; marginal vein shorter than submarginal vein; antero-lateral margins of pronotum obtuse (Hayat, 1974 a, fig. 2). . .Coccophagoides Girault

__ Antennal club distinctly separated from funicle; club blunt at apex; marginal vein longer than submarginal vein; antero-lateral margins of pronotum acute (Pl. 38, figs. C & L). . . . . Prospaltella Ashmead

TRIBE: COCCOPHAGINI FOERSTER

The tribal characters viz. "Pronotum formed of one piece and absence of membranous area in middle" proposed by Shafee and Khan (1978) are confirmed as stable and apply well on the genera: Coccophagus Westwood (Pl. 29, figs. D & N; Pl. 30, figs. F & K; Pl. 31, figs. C & K; Pl. 32, fig. C;

Pl. 33, fig. D; Pl. 34, fig. C; Alam, 1956, fig. 10; Zinna, 1961, Pl. 3, fig. 2; Nikol'skaya & Yasnosh, 1966, figs. 287, 295, 300, 305, 313, 319, 324, 331, 341 & 346; Hayat, 1971 b, fig. 8); Aneristus Howard (Pl. 35, fig. E); Physcus Howard (Pl. 36, fig. C); Ablerus Howard (Pl. 37, fig. B; Hayat, 1974 b, fig. 12) and Azotus Howard (Pl. 37, fig. I; Alam, 1956, fig. 31; Zinna, 1962, Pl. 30, fig. 2; Agarwal, 1964 b, fig. 17).

8. Genus Coccophagus Westwood

Coccophagus Westwood, 1833, Phil. Mag., 3: 344.
Type-species: Entedon scutellaris Dalman.
Paracharitopus Brèthes, 1913, An. Mus. Nac. Hist. Buenos Aires, 24: 105.
Type-species: Paracharitopus lecanii Brèthes (Monobasic).
Onophilus Brèthes, 1918, An. Soc. Rural Argentina, 53, 155.
Type-species: Onophilus caridei Brèthes (Monobasic).
Parencarsia Mercet, 1930, Eos, 6: 198.
Type-species: Coccophagus krygeri Mercet (Monobasic).

The genus Coccophagus was proposed by Westwood (1833 a). He (1840) designated Entedon scutellaris Dalman as the type species. Mercet (1928) synonymized the genus Onophilus Brèthes with Coccophagus Westwood. De Santis (1946) declared the genera Paracharitopus Brèthes and Parencarsia Mercet as

synonyms of Coccophagus Westwood. A comprehensive study of this genus was made by Compere (1931). The species belonging to this genus are usually parasites of Coccids. Alam (1956) proposed new generic characters of pronotum and genitalia. Later, these characters have been uphold by Nikol'skaya and Yasnosh (1966), Hayat (1971 b, 1974 a). Shafee's (1972) key to species of the genus Coccophagus Westwood based on females has been revised in order to incorporate some additional specific characters and also to accommodate C. shafeei Hayat, C. chloropulvinariae Hayat, C. sexvittatus Compere and C. mysorensis sp. n. The species C. diaspidis Agarwal, C. citri Agarwal and C. delhiensis Subba Rao and Rai are omitted from the key, since, Hayat (1974c) declared them as synonyms of Aneristus ceroplastae Howard.

Revised key to Indian species of Coccophagus Westwood, based on females

1. Scutellum with only 3 pairs of setae. 2

— Scutellum densely setose. 21

2. Pedicel distinctly longer than first funicle segment; first funicle segment shorter than second; club usually as long as or longer than funicle; pronotum usually narrow in middle and without posterior submarginal ridge (Pl. 29, figs. D & N; Zinna, 1961, Pl. 3, fig. 2). 3

__ Pedicel not longer than first funicle segment; first funicle segment not shorter than second; club distinctly shorter than funicle; pronotum usually broad and with posterior submarginal ridge (Pl. 30, figs. F & K; Pl. 31, figs. C & K; Pl. 32, fig. C; Hayat, 1971 b, fig. 8). 6

3. Funicle segments 1-3 as long as or longer than wide; club more than twice as long as wide. 4

__ Funicle segments 1-3 distinctly wider than long; club twice as long as wide; scape slightly more than thrice as long as wide. . . . . C. longipedicellus Shafee

4. First funicle segment less than twice as long as wide. 5

__ First funicle segment twice as long as wide; general colour ochraceous to honey-yellow marked with blackish to dark brown at collar of pronotum and anterior margin of mesoscutum, and a broad band across basal half of abdomen. . . . . C. ochraceus Howard

5. Body yellowish, marked on either side with a longitudinal dark brown stripe continuous from pronotum to apex of abdomen; mesoscutum with 23 pairs of setae; club about as long as funicle, three times as long as wide; first funicle segment one and a half times as long as wide; posterior margin of pronotum with 6 pairs of setae; first valvifers almost triangular with basal, inner and outer margins straight (Pl. 29, fig. H;

Zinna, 1961, Pl. 7, fig. 2); anterior margin of basal part of second valvifers semicircular; third valvulae long and narrow, more than one-third the length of second valvifers (Pl. 29, fig. I; Zinna, 1961, Pl. 7, fig. 2). . . . . C. bivittatus Compere

__ Body yellowish brown, not marked on either side with longitudinal dark brown stripe; mesoscutum with 14 pairs of setae; club longer than funicle, five times as long as wide; first funicle segment as long as wide; posterior margin of pronotum with 9 pairs of setae. . . . . ; . . . . . .C. longiclavatus Shafee

6. Each axilla usually with two setae. 7

__ Axillae about as densely and conspicuously setose as the mesoscutum; first funicle segment four times as long as wide; head, legs and most of the thorax yellow; abdomen blackish. . . . . .C. redini Girault

7. Body particoloured, or predominently yellow. 8

__ Body black or brownish black, without any yellow markings except the median part of metanotum. 19

8. Body black except apex of scutellum yellow. 9

__ Head and thorax yellow. 10

9. Legs pale yellow, only hind femora and tibiae slightly suffused with dusky; scutellum almost entirely yellow. . . . . C. bogoriensis (Koningsberger)

__ All coxae black; all femora more or less extensively

brownish; anterior margin of scutellum broadly blackish; posterior margin of pronotum with 12 pairs of setae (Pl. 30, fig. K; Hayat, 1971 b, fig. 8). . . . . .
. . . . . C. cowperi Girault

10. First funicle segment at least one and a half times longer than pedicel and usually longer than second segment.
. 11

__ First funicle segment as long or slightly longer than pedicel and not longer than second segment. 16

11. First funicle segment distinctly less than four times longer than wide; funicle unicoloured. 12

__ First funicle segment five times longer than wide; middle of first funicle segment, second segment entire and basal two club segments brown, rest of flagellum yellow. . . . . C. longicornis Hayat

12. First funicle segment distinctly longer than following segments. 13

__ Funicle segments 1-3 subequal in length; abdomen with two brown dots on either side of second tergum, rest of second and whole of third terga yellow, rest of the abdomen brown; frontovertex longer than wide; marginal vein longer than submarginal vein; tibial spur of middle legs shorter than basitarsus. . . . . C. burksi Hayat

13. Abdomen pale yellow or with six dark brown bands. . . 14

__ Abdomen completely black; costal cell shorter than marginal vein; first valvifers with basal and outer margins concave (Pl. 31, figs. F & M); anterior margin of basal part of second valvifers semicircular (Pl. 31, figs. G & O). 15

14. Abdomen yellow with dark brown cross bands on dorsum; head and thorax yellow with sides of foramen, sides of pronotum, anterior margin of mesoscutum, scutoscutellar suture and anterior margin of scutellum brownish; costal cell as long as marginal vein; postmarginal vein rudimentary. . . . . C.sexvittatus Hayat

__ Abdomen completely yellow; postmarginal vein well developed. . . . . .C. perhispidis Girault

15. Pedicel one-half the length of first funicle segment; first funicle segment two and a half times as long as wide, longer than second and third segments separately; club three and a half times as long as wide; pronotum with irregular brown patch in middle, posterior submarginal ridge with 13 pairs of setae; first valvifers with basal margin slightly shorter than outer margin (Pl. 31, fig. F); third valvulae five times as long as wide, one-third the length of second valvifers (Pl. 31, fig. G). . . . . C. tschirchii Mahdihassan

__ Pedicel slightly shorter than first funicle segment; first funicle segment slightly longer than wide, as long as second and third segments separately; club two

and a half times as long as wide; pronotum uniformly dark brown, posterior submarginal ridge with 11 pairs of setae; first valvifers with basal margin about one-half the length of outer margin (Pl. 31, fig. N); third valvulae three times as long as wide, less than one-third the length of second valvifers (Pl. 31, fig. O). . . . . C. mysorensis sp. n.

16. Submarginal vein longer than marginal vein. 17

__ Submarginal vein shorter than marginal vein. 18

17. Occiput yellow; scape about five times as long as wide; pedicel about one and a half times as long as wide; first funicle segment shorter than following funicle segments separately; each parapside with 3 setae; meso-postphragma narrowly notched at apex; postmarginal vein one-half the length of stigmal vein; first valvifers like elongated triangle with basal, inner and outer margins straight (Pl. 32, fig. J); anterior margin of basal part of second valvifers U-shaped (Pl. 32, fig. K); third valvulae about five times as long as wide, one-third the length of second valvifers (Pl. 32, fig. K); posterior margin of subgenital plate straight with a small notch in middle (Pl. 32, fig. M). . . . . .

. . . . . C. manii Agarwal

__ Occiput black; scape four and a half times as long as wide; pedicel two times longer than wide; first funicle

segment longer than following segments separately; each parapside with 4 setae; mesopostphragma narrowly rounded at apex with a notch; postmarginal vein one-fourth the length of stigmal vein. . . . . C. indicus Agarwal

18. Postmarginal vein one-half the length of stigmal vein; hind coxae and femora swollen; tibial spur of middle legs shorter than basitarsus; ovipositor concealed; upper one-fifth of abdomen yellow, rest blackish; frontovertex yellowish. . . . .C. zebratulus Subba Rao & Rai

__ Postmarginal vein vestigial; tibial spur of middle legs as long as basitarsus; ovipositor slightly protruding; upper one-third of abdomen yellow, rest blackish; frontovertex blackish. . . . . C. coorgensis Subba Rao & Rai

19. Legs predominently black or dark brown, some times with bases and apices yellow. 20

__ Legs predominently yellow, only the hind tibiae more or less black; face and cheeks mostly yellow; tegulae and parapsides suffused with brownish; scape concolorous with face, flagellum dark brown. . .C. flavifrons Howard

20. Face, cheeks and antennae brownish yellow; setae on dorsal margin of hind tibiae suberect and slightly stronger than normal; setae on middle knees rather stronger; sides of the first and fifth terga without markings. . . . . .C. antthracinus Compere

__ Face, cheeks and antennae completely blackish; setae on dorsal margin of hind tibiae normal; femora and tibiae

not distinctly tipped with yellow but pallid at the ends; antennae more slender and with fewer sensoria; sides of fifth and sixth terga with markings. . . . . C. atratus Compere

21. Pedicel distinctly shorter than first funicle segment. 22

__ Pedicel longer than first funicle segment; paired bristles at apex of scutellum one and a half times as long as scutellum; head predominently dark; legs entirely blackish brown only the tarsi obscurely pale; marginal vein nearly twice as long as submarginal vein; scutellum about one and a half times as wide as long. C. acanthosceles Waterston

22. Body particoloured or predominently yellow; ovipositor arises from base of abdomen; third valvulae short, one-fifth to one-sixth the length of second valvifers (Hayat, 1974 c, figs. 3, 10 & 14; 1974 a, fig. 9). . .23

__ Body completely black; head with medio-frontal ocellar, orbito-occipital, orbital, ocello-occipital and facial hyaline bands; marginal vein distinctly longer than submarginal vein; ovipositor arises from basal one-half of abdominal venter; basal and outer margins of first valvifers deeply concave, inner margin convex (Pl. 33, fig. H); anterior margin of basal part of second valvifers semicircular; third valvulae about one-fourth the length of second valvifers (Pl. 33, fig. I); posterior margin of

pronotum with 13 pairs of setae (Pl. 33, fig. D). . . . . .C. nigricorpus Shafee

23. Body completely orange yellow; anterior margin of basal part of second valvifers U-shaped (Hayat, 1974 c, figs. 10 & 14). 24

__ Body lemon yellow with infuscated patches. 25

24. Disc of fore wings sparsely setose; submarginal and marginal veins with 7 and 13 setae respectively; costal cell with about 15 setae arranged in single row; middle tibial spur shorter than basitarsus; basitarsus of middle legs slightly less than one-half the tibiae; abdomen pale yellow with brown spot in center of each terga 1-5; distal two-thirds of second valvifers and whole of third valvulae brown (Hayat, 1974 c, fig. 14) . . . . . .C. gilvus Hayat

__ Disc of fore wings densely setose; submarginal and marginal veins with 9 and about 22 setae respectively; costal cell with about 30 setae arranged in two rows; middle tibial spur subequal to basitarsus; basitarsus of middle legs a trifle over one-third of tibia; abdomen pale yellow; second valvifers pale yellow; third valvulae brown (Hayat, 1974 c, fig. 10).C. shafeei Hayat

25. First funicle segment much longer than second; thorax with black setae; third valvulae one-sixth the length of second valvifers (Hayat, 1974 c, fig. 3). . . . . .C. silvestrii Compere

__ First and second funicle segments subequal in length; thorax with yellow setae; anterior margin of basal part of second valvifers semicircular (Hayat, 1974 a, fig. 9); third valvulae short, one-fifth the length of second valvifers (Hayat, 1974 a, fig. 9). . . . . C. chloropulvinariae Hayat

Key to some Indian species of Coccophagus Westwood, based on males

1. Scutellum with only 3 pairs of setae. 2
__ Scutellum densely setose. 8
2. First funicle segment not longer than second; club as long as or longer than funicle. 3
__ First funicle segment distinctly longer than second; club shorter than funicle. 5
3. Sides of body without dark longitudinal bands. 4
__ Body yellowish marked on either side with a longitudinal dark brown stripe continuous from pronotum to apex of abdomen; pedicel small, as long as wide, half the length of first funicle segment; funicle segments 1-3 subequal in length; male genitalia with gonobase reaching upto apex of aedeagus, digitus absent (Pl. 25, fig. L). . . . . .C. bivittatus Compere
4. Funicle and club segments each with 2-3 sensoria; scape more than half the length of club; pedicel slightly

longer than wide, more than one-half the length of first funicle segment; funicle segments 1-3 subequal in length, each less than twice as long as wide (Pl. 29, fig. K); club slightly more than four times as long as wide. . . . . .C. longiclavatus Shafee

__ Funicle and club segments each with 5-6 sensoria; scape less than one-half the length of club; pedicel as long as wide, half the length of first funicle segment; funicle segments second and third subequal, each twice as long as wide; first segment slightly shorter than following segments separately (Hayat, 1971 b, fig. 24) . . . . . C.burksi Hayat

5. Funicle segments 1-3 each less than one and a half times as long as wide; pedicel more than one-half the length of first funicle segment. 6

__ Funicle segment first two and a half times, second and third two times as long as wide; pedicel one-half the length of first funicle segment; club four and a half times as long as wide. . . . . C. tschirchii Mahdihassan

6. Coxae yellow or brownish; gonobase of male genitalia without long process (Pl. 31, fig. S; Pl. 32, fig. O)..7

__ All coxae dark; male genitalia with gonobase having two long processes, each bearing a single seta apically (Pl. 30, fig. O); each axilla with two setae; body completely dark; scape three and a half times as long as

wide, shorter than club; pedicel shorter than first funicle segment, slightly longer than wide; second and third segments subequal. . . . . .C. cowperi Girault

7. Legs completely yellow; scape two and a half times as long as wide, shorter than the length of pedicel and first funicle segment together; pronotum with an irregular brown patch in middle; abdomen dark brown with yellow patches; male genitalia with gonobase dialated, slightly shorter than aedeagus, aedeagus broadly rounded at apex (Pl. 32, fig. O). . . . . C. manii Agarwal

__ Legs yellowish brown; scape three and a half times as long as wide, as long as the length of pedicel and first funicle segment together; pronotum completely brown; abdomen dark; male genitalia with gonobase of uniform width, as long as aedeagus, aedeagus narrow at apex (Pl. 31, fig. S). . . . . .C. mysorensis sp. n.

8. Body completely yellow; pedicel one-half the length of first funicle segment. . . . . C. gilvus Hayat

__ Body lemon yellow with infuscated patches; pedicel less than one-half the length of first funicle segment; male genitalia with gonobase shorter than aedeagus, aedeagus long and of uniform width (Pl. 34, fig. G).. . . . . .C. silvestrii Compere

Coccophagus bivittatus Compere

(Plate 29, figs. A-L)

Coccophagus bivittatus Compere, 1931, Proc. U.S. natn. Mus., 78: 73.

Coccophagus bivittatus Compere; De Santis, 1948, Rev. Mus. La. Plata (N.S.) 5 (Zool.): 168.

Coccophagus bivittatus Compere; Zinna, 1961, Boll. Lab. Ent. Agr. Portici, 19: 317.

Coccophagus bivittatus Compere; Hayat, 1971, Entomophaga, 16:428.

Coccophagus bivittatus Compere; Shafee, 1972, Bull.Ent.,13: 24.

Some additional specific characters are proposed which almost agree with the illustrations of C. bivittatus Compere given by Zinna (1961). The characters are as follows: Posterior margin of pronotum slightly concave, posterior submarginal ridge absent (fig. D; Zinna, 1961, Pl. 3, fig. 2); first valvifers triangular with basal, inner and outer margins straight (fig. H; Zinna, 1961, Pl. 7, fig. 2); anterior margin of basal part of second valvifers semicircular; third valvulae long and narrow, more than one-third the length of second valvifers (fig. I; Zinna, 1961, Pl. 7, fig. 2). The illustration of male antenna (fig. K) given by the author agree with antennal illustrations of C. bivittatus Compere given by De Santis (1948, fig. 28 c) and Hayat (1971, fig. 29). However, it does

not completely agree with the antennal diagram given by Zinna, (1961, Pl. 9, fig. 2). In Zinna's illustration the antennal club shorter than funicle.

Material examined.- 5 ♀, 2 ♂, INDIA: Andhra Pradesh, Guntur, ex Cerococcus hibisci Green on Hibiscus rosa-sinensis Linn., 16.iii.1976 (M. Younus Khan).

Coccophagus longiclavatus Shafee

(Plate 29, figs. M-Q)

Coccophagus longiclavatus Shafee, 1972, Bull. Ent., 13: 25.

Material examined.- 4 ♀, 1 ♂, INDIA: Uttar Pradesh, Aligarh, ex Kerria lacca (Kerr) on Ficus infactoria, 2.xi.1975 (M. Younus Khan).

Coccophagus longipedicellus Shafee

(Plate 30, figs. A-C)

Coccophagus longipedicellus Shafee, 1972, Bull. Ent., 13: 25.

Material examined.- 1 ♀, INDIA: Karnatka, Tumkur, ex Coccus sp. on Mangifera indica Linn., 5.vii.1968 (S. Adam Shafee).

Coccophagus bogoriensis (Koningsberger)

(Plate 30, figs. D-H)

Encyrtus bogoriensis Koningsberger, 1897, Meded. Plant., 20:14.

PLATE 29

Figs. A-L. Coccophagus bivittatus Compere

A. Mandible, ♀

B. Maxillary and labial palpi, ♀

C. Antennae, ♀

D. Pronotum, ♀

E. Abdomen and thorax except pronotum in dorsal view, ♀

F. Fore wing, ♀

G. Part of fore wing venation, ♀

H. First valvifer, ♀

I. Second valvifer and third valvula, ♀

J. Outer plate of ovipositor, ♀

K. Antenna, ♂

L. Genitalia, ♂

Figs. M-Q. Coccophagus longiclavatus Shafee

M. Antenna, ♀

N. Pronotum, ♀

O. Propodeum and part of thorax in dorsal view, ♀

P. Fore wing, ♀

Q. Antenna, ♂

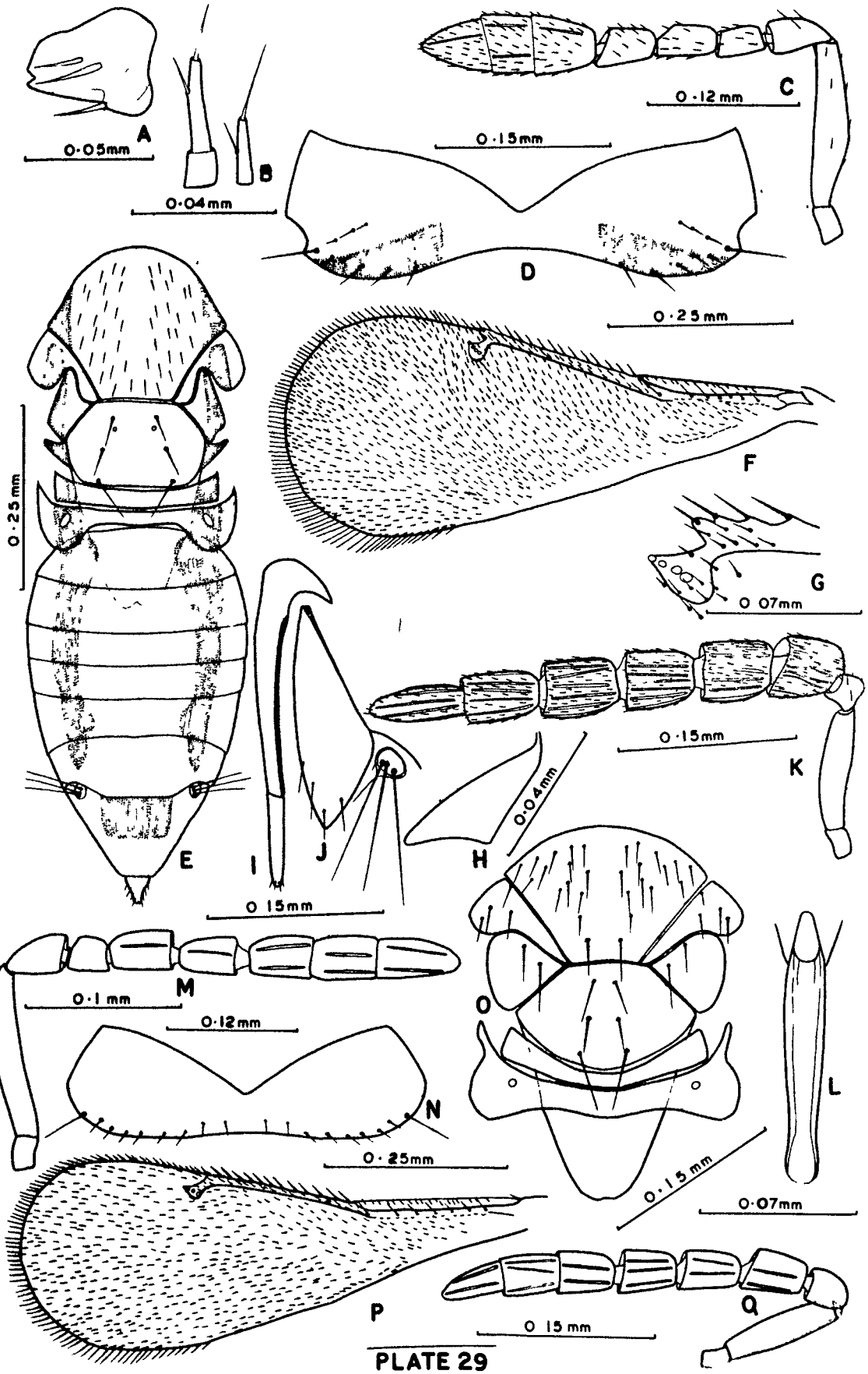
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PLATE 29

Coccophagus javae Girault, 1916, Proc. U.S. natn.Mus., 51:482.

Coccophagus bogoriensis (Koningsberger): Compere, 1931, Proc. U.S. natn. Mus., 78: 57.

Coccophagus bogoriensis (Koningsberger); Hayat, 1971, Entomophaga, 16: 424.

Coccophagus bogoriensis (Koningsberger): Shafee, 1972, Bull. Ent., 13: 27.

Material examined.- 5♀, INDIA: Uttar Pradesh, Aligarh, University Botanical Garden ex Coccus viridis (Green) on weed plant, 2.xi.1975 (M. Younus Khan).

Coccophagus cowperi Girault

(Plate 30, figs. I-O)

Coccophagus cowperi Girault, 1917, Descriptiones stellarum Novarum. p. 1.

Coccophagus cowperi Girault; Hayat, 1971, Entomophaga, 16: 422.

Coccophagus cowperi Girault; Shafee, 1972, Bull. Ent., 13: 24.

The present writer proposed some additional specific characters which are as follows: Pronotum with posterior margin straight, posterior submarginal ridge bearing 12 pairs of setae (fig. K; Hayat, 1971 b, fig. 9); male genitalia with gobobase having two long prolongations, each bearing single seta apically, gonobase shorter than aedeagus (fig. O).

PLATE 30

Figs. A-C. Coccophagus longipedicellus Shafee

A. Antenna, ♀

B. Fore wing, ♀

C. Part of fore wing venation, ♀

Figs. D-H. Coccophagus bogoriensis (Koningsberger)

D. Mandible, ♀

E. Antenna, ♀

F. Pronotum, ♀

G. Fore wing venation, ♀

H. Part of fore wing venation, ♀

Figs. I-O. Coccophagus cowperi Girault

I. Mandible, ♀

J. Antenna, ♀

K. Pronotum, ♀

L. Fore wing venation, ♀

M. Part of fore wing venation, ♀

N. Antenna, ♂

O. Genitalia, ♂

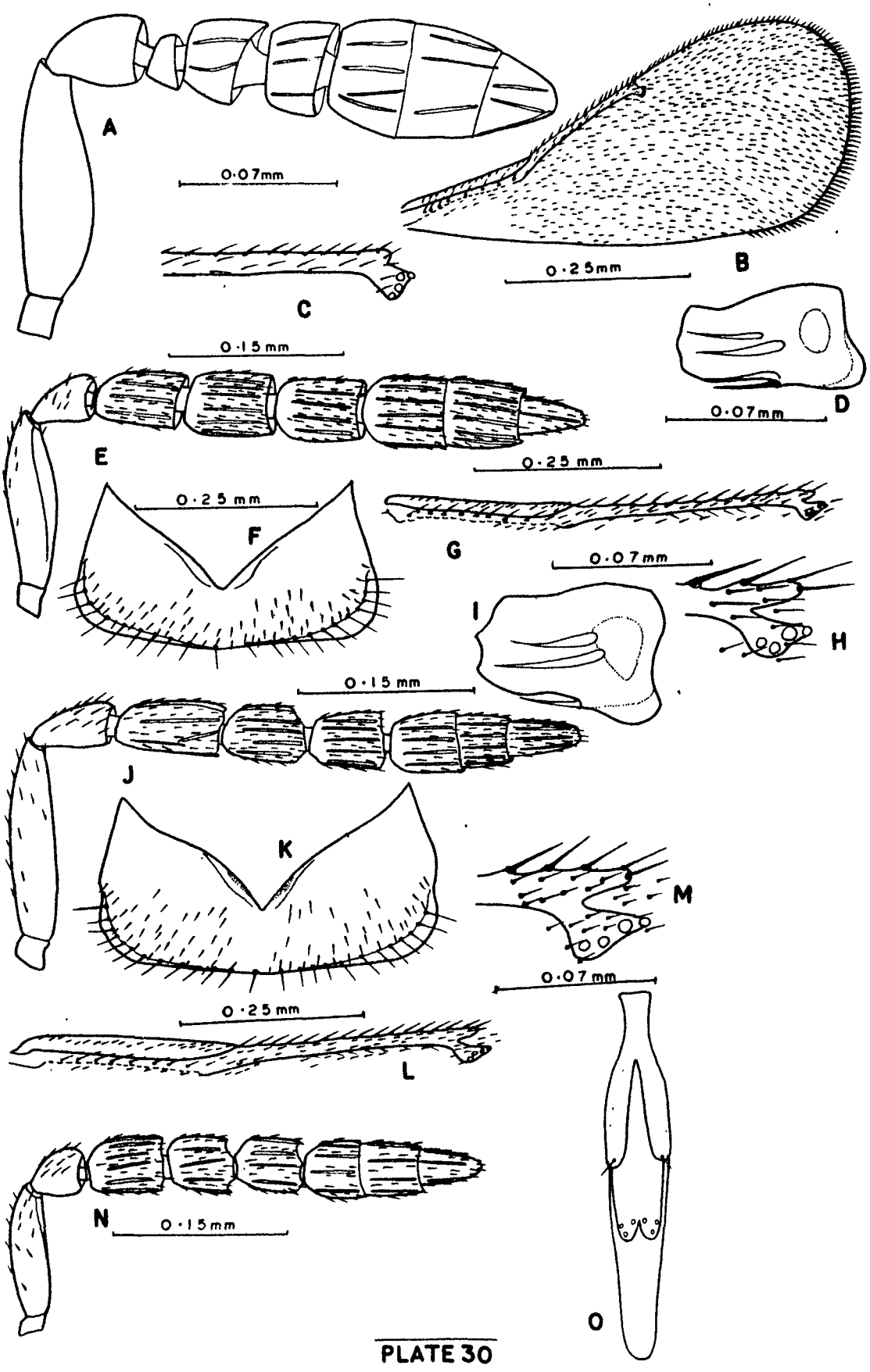
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PLATE 30

Material examined.- 6 ♀, 2 ♂, INDIA: Andhra Pradesh, Guntur, ex Nipaecoccus vastator (Maskell) on Acacia arabica, 14.i.1976 (M. Younus Khan); 8 ♀, 4 ♂, Karnatka, Tumkur, ex Coccid on Tephrosia purpurea, 6.vii.1976 (M. Younus Khan).

Coccophagus tschirchii Mahdihassan

(Plate 31, figs. A-H)

Coccophagus tschirchii Mahdihassan, 1923, Jour. Sci. Assoc. Maharajah's Coll., India, 1: 82.

Coccophagus tschirchii Mahdihassan; Ferrière, 1928, Bull. ent. Res., 19: 173.

Coccophagus tschirchii Mahdihassan; Shafee, 1972, Bull. Ent., 13: 27.

The present writer proposed some additional specific characters which are as follows: Pronotum with posterior margin straight, posterior submarginal ridge well developed bearing 13 pairs of setae (fig. C); first valvifers with basal and outer margins concave, inner margin convex (fig. F); anterior margin of basal part of second valvifers not much curved, semicircular; third valvulae long, five times as long as wide, one-third the length of second valvifers (fig. G).

Material examined.- 15 ♀, INDIA: Uttar Pradesh, Aligarh,

University Botanical Garden, ex Coccus hesperidum Linn. on Ficus carica, 7.vii.1974 (M. Younus Khan).

Coccophagus mysorensis sp. n.

(Plate 31, figs. I-S)

Female.

Head.- Orange yellow, wider than long in facial view; frontovertex wider than long; ocelli white, arranged in obtuse triangle, lateral ocelli more than their own diameters from orbital margin; eyes dark brown and sparsely setose; malar space longer than eye width; antennae inserted at lower level of eyes; maxillary and labial palpi 2 and 1-segmented respectively; mandibles as shown in fig. I.

Antennae (fig. J).- Brownish, 8-segmented; scape cylindrical, four and a half times as long as wide; pedicel longer than wide, slightly shorter than first funicle segment; funicle 3-segmented; first funicle segment slightly longer than wide, second and third subequal, each as long as wide; club 3-segmented, two and a half times as long as wide, longer than preceding two funicle segments together.

Thorax.- Orange yellow, except anterior margin of scutum and axillae brown; pronotum with anterior margin acutely notch in middle, posterior margin straight, posterior submarginal ridge with 11 pairs of setae (fig. K); scutum

wider than long, densely setose; each axilla and parapside with 1 and 2 setae respectively; scutellum with only 3 pairs of setae.

Fore wings.- Hyaline, slightly more than twice as long as wide (0.78:0.34 mm); costal cell long and narrow with 20 setae; submarginal vein shorter than marginal vein and with 8 setae; marginal vein with 13 setae (fig. L); postmarginal vein slightly shorter than stigmal vein (fig. M); marginal fringe short.

Hind wings.- Hyaline, four times as long as wide; marginal fringe spaced by a distance equal to one-fourth their length.

Legs.- Yellowish brown; tarsi 5-jointed; middle tibial spur shorter than basitarsus.

Abdomen.- Brown, longer than thorax; ovipositor concealed, arising from basal one-third of abdominal venter; first valvifers triangular with basal and apical angles at different levels, basal and outer margins concave, inner margin convex (fig. N); anterior margin of basal part of second valvifers not much curved, semicircular; third valvulae three times as long as wide, less than one-third the length of second valvifers (fig. O); outer plates of ovipositor narrow at base, broadly truncated at apex (fig. P); subgenital

PLATE 31

Figs. A-H. *Coccophagus tschirchii* Mahdihassan

A. Mandible, ♀

B. Antenna, ♀

C. Pronotum, ♀

D. Fore wing venation, ♀

E. Part of fore wing venation, ♀

F. First valvifer, ♀

G. Second valvifer and third valvula, ♀

H. Outer plate of ovipositor, ♀

Figs. I-S. *Coccophagus mysorensis* sp. n.

I. Mandible, ♀

J. Antenna, ♀

K. Pronotum, ♀

L. Fore wing venation, ♀

M. Part of fore wing venation, ♀

N. First valvifer, ♀

O. Second valvifer and third valvula, ♀

P. Outer plate of ovipositor, ♀

Q. Subgenital plate, ♀

R. Antenna, ♂

S. Genitalia, ♂

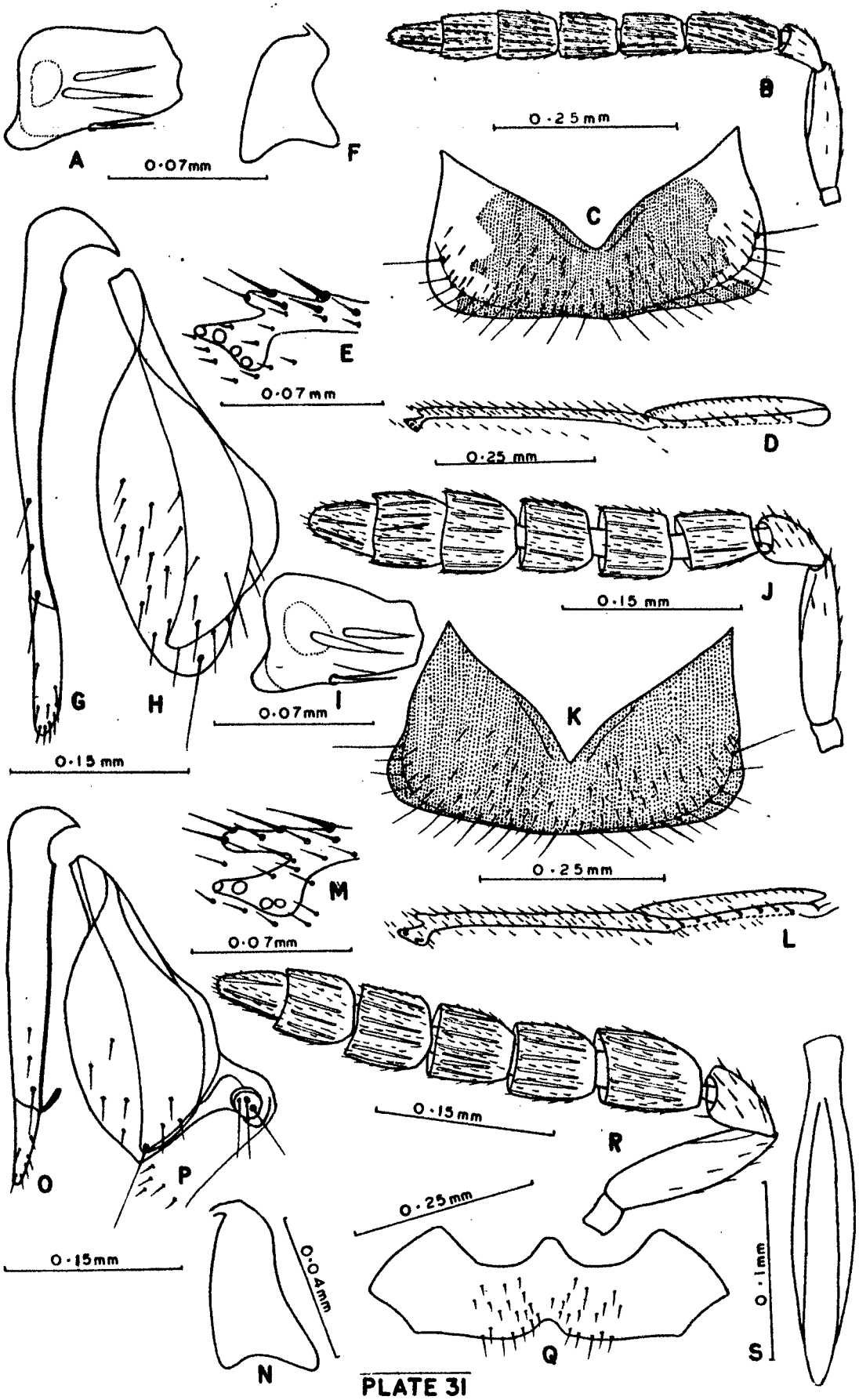
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PLATE 31

plate narrow, posterior margin with a notch in middle (fig. Q).

Female length: 0.99 mm.

Male.

Resembles female except in the following characters:

Scape slightly more than three times as long as wide; first funicle segment longer than following segments separately; club about three times as long as wide (fig. R); male genitalia with gonobase longer than aedeagus, aedeagus of uniform width; digitus absent (fig. S).

Male length: 0.85 mm.

Holotype ♀. INDIA: Karnatka, Bangalore, Channapatna, ex Ceroplatodes sp. on weed plant, 29.vi.1976 (M. Younus Khan).

Paratypes. 5 ♀, 3 ♂ (same data as holotype).

Coccophagus manii Agarwal

(Plate 32, figs. A-O)

Coccophagus manii, Agarwal, 1964, Proc. Indian Acad. Sci., (B)59: 263.

Coccophagus manii Agarwal; Shafee, 1972, Bull. Ent., 13: 27.

The present writer proposed some additional specific characters which are as follows: Pronotum with posterior margin

PLATE 32

Figs. A-O. Coccophagus manii Agarwal

A. Mandible, ♀

B. Antenna, ♀

C. Pronotum, ♀

D. Propodeum and part of thorax in dorsal view, ♀

E. Fore wing, ♀

F. Part of fore wing venation, ♀

G. Part of fore leg, ♀

H. Part of middle leg, ♀

I. Part of hind leg, ♀

J. First valvifer, ♀

K. Second valvifer and third valvula, ♀

L. Outer plate of ovipositor, ♀

M. Subgenital plate, ♀

N. Antenna, ♂

O. Genitalia, ♂

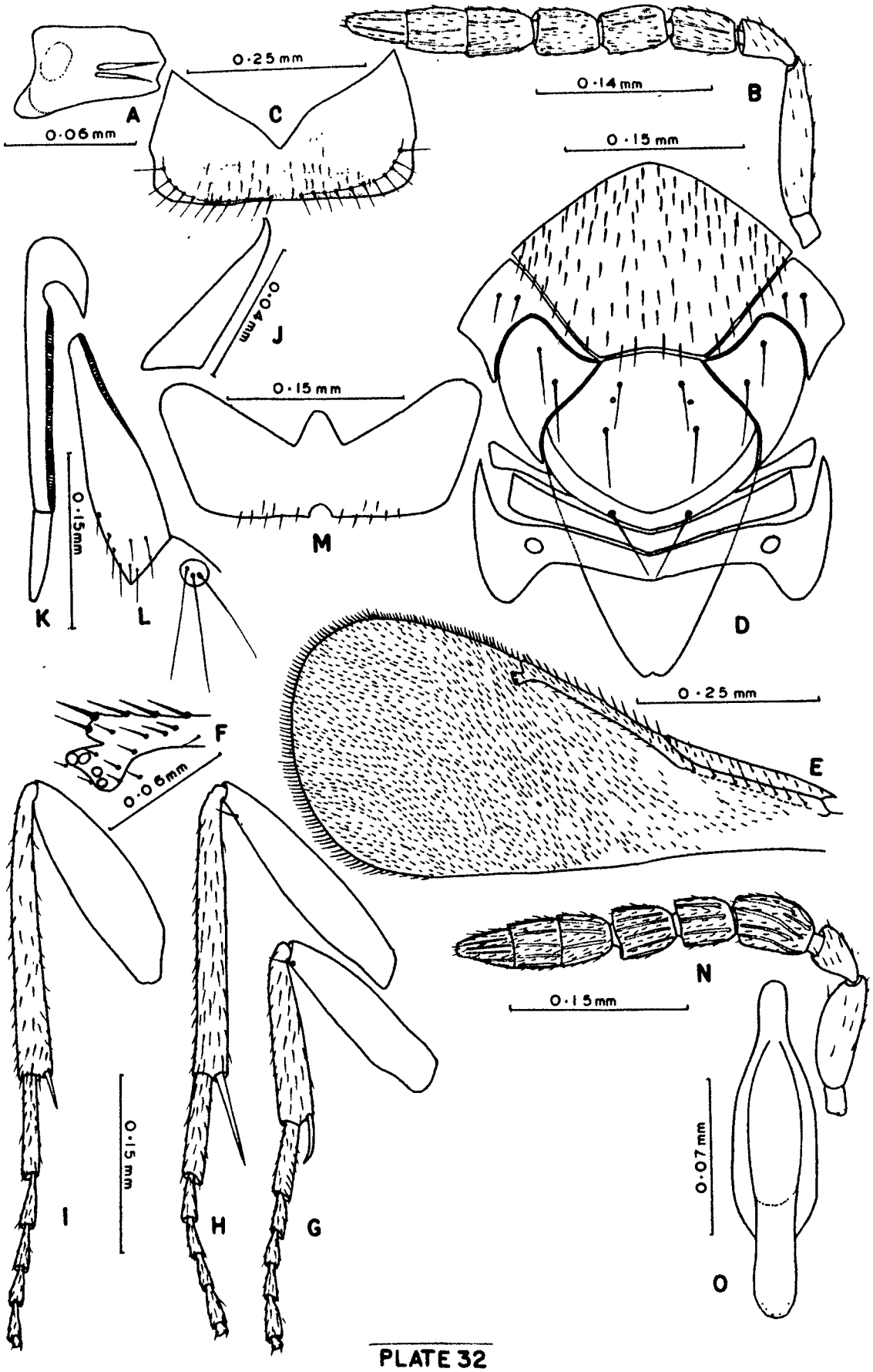
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PLATE 32

straight, posterior submarginal ridge well developed bearing 11 pairs of setae (fig. C); first valvifers like an elongated triangle with basal, outer and inner margins straight (fig.J); anterior margin of basal part of second valvifers much curved, U-shaped, third valvulae long, five times as long as wide, one-third the length of second valvifers (fig. K); posterior margin of subgenital plate straight with a small notch in middle (fig. L). Male antennal scape two and a half times as long as wide; pedicel slightly longer than wide, slightly more than one-half the length of first funicle segment; first funicle segment longest, one and a half times as long as wide, segments second and third each as long as wide; club three times as long as wide, longer than preceding two funicle segments together (fig. N); male genitalia with gonobase dialated slightly shorter than aedeagus, aedeagus broadly rounded at apex (fig. O).

Material examined.- 10 ♀, 6 ♂, INDIA: Uttar Pradesh, Aligarh, ex Cerococcus hibisci Green on Hibiscus rosa-sinensis Linn., 2.vii.1976 (M. Younus Khan).

Coccophagus nigricorpus Shafee

(Plate 33, figs. A-K)

Coccophagus nigricorpus Shafee, 1972, Bull. Ent., 13: 22.

The present writer proposed some additional specific

PLATE 53

Figs. A-K. *Coccophagus nigricorpus* Shafee

A. Head, dorsal view, ♀

B. Mandible, ♀

C. Antenna, ♀

D. Pronotum, ♀

E. Propodeum and part of thorax in dorsal view, ♀

F. Fore wing venation, ♀

G. Part of fore wing venation, ♀

H. First valvifer, ♀

I. Second valvifer and third valvula, ♀

J. Outer plate of ovipositor, ♀

K. Subgenital plate, ♀

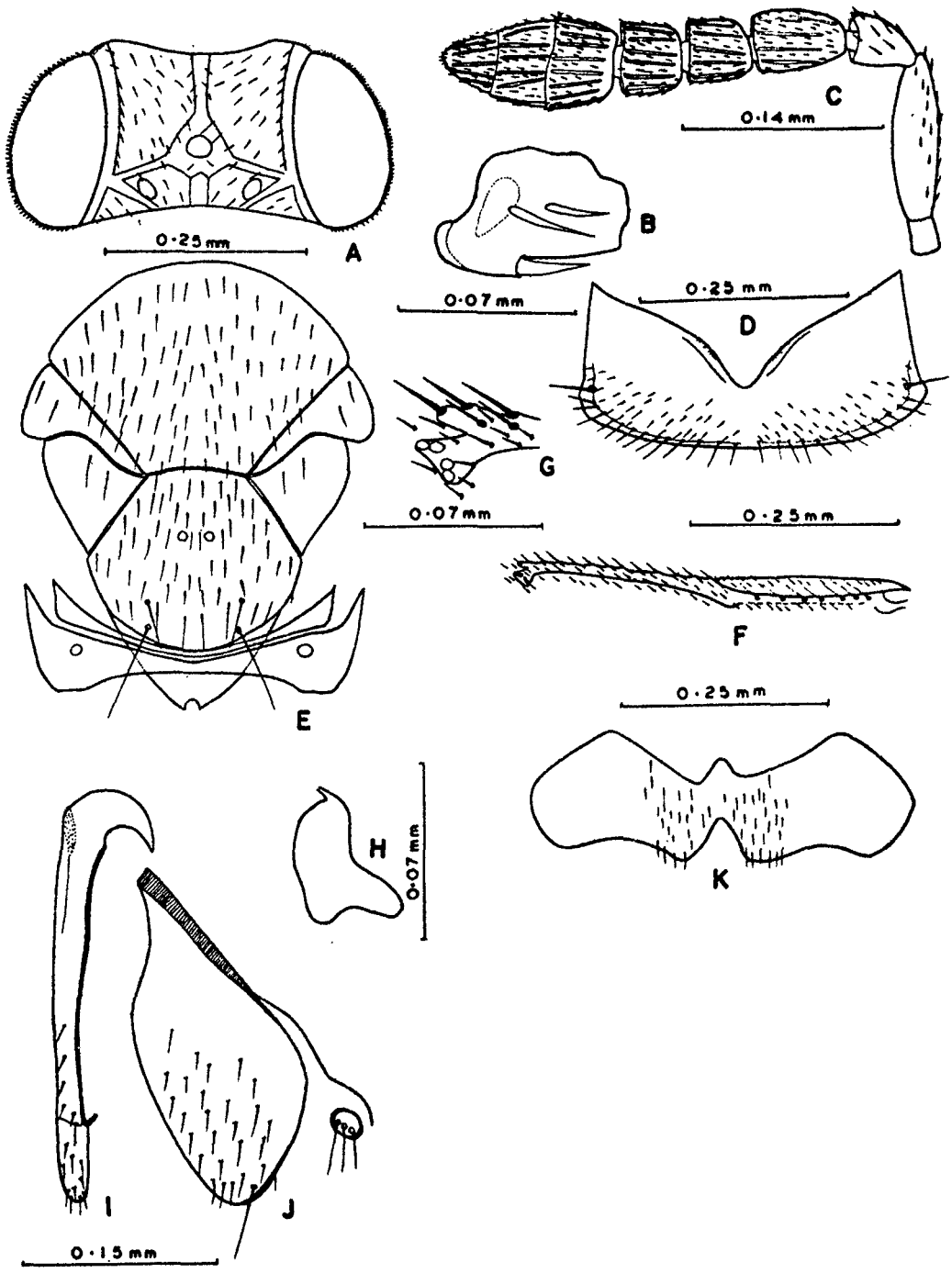
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PLATE 33

characters which are as follows: Posterior submarginal ridge of pronotum with 13 pairs of setae (fig. D); first valvifers with basal and outer margins concave, inner margin convex (fig. H); anterior margin of basal part of second valvifers slightly curved, semicircular; third valvulae short, less than three times as long as wide, one-fourth the length of second valvifers (fig. I); subgenital plate narrow, posterior margin with a well developed notch in middle (fig. K).

Material examined.- 20 ♀, INDIA: Andhra Pradesh, Kurnool, Diguvametta, ex Pulvinaria sp. on weed plant, 16.ii.1976 (M. Younus Khan).

Coccophagus silvestrii Compere

(Plate 34, figs. A-G)

Coccophagus silvestrii Compere, 1931, Proc. U.S. natn. Mus., 78: 57.

Coccophagus silvestrii Compere; Shafee, 1972, Bull. Ent., 13:24.

The present writer proposed some additional specific characters which are as follows: Pronotum with posterior margin slightly curved, posterior submarginal ridge with 13 pairs of setae (fig. C); male genitalia with gonobase of uniform width, five times as long as wide, shorter than aedeagus, aedeagus long and of uniform width (fig. G).

Material examined.- 10 ♀, 4 ♂, INDIA: Uttar Pradesh,

Ranipur, ex Coccid on Tephrosis purpurea, 1.vii.1976 (M. Younus Khan): 4 ♀, 3 ♂, Tamil Nadu, Tenkasi, ex Rastrococcus icervoides (Green), on weed plant, 5.iii.1976 (M. Younus Khan).

Coccophagus shafeei Hayat

(Plate 34, figs. H-K)

Coccophagus shafeei Hayat, 1974, Oriental Insects, 8: 294.

Material examined.- 4 ♀, INDIA: Karnatka, Bangalore, ex Coccus sp. on Mangifera indica Linn., 5.vii. 1968 (S. Adam Shafee).

9. Genus Aneristus Howard

Aneristus Howard, 1895, Canad. Ent., 27: 351.

Type-species: Aneristus ceroplastae Howard (Monobasic).

The genus Aneristus was proposed by Howard (1895 b) for the species Aneristus ceroplastae Howard. Dozier (1932 a) declared Prococcophagus Silvestri as synonym of Aneristus Howard. Later, Compere (1936) revalidated the genus Prococcophagus Silvestri on the basis of absence of strong setae on the apex of middle tibae and normal funicle. This was accepted by all the recent workers. The distinguishing

PLATE 34

Figs. A-G. *Coccophagus silvestrii* Compere

A. Mandible, ♀

B. Antenna, ♀

C. Pronotum, ♀

D. Fore wing venation, ♀

E. Part of fore wing venation, ♀

F. Antenna, ♂

G. Genitalia, ♂

Figs, H-K. *Coccophagus shafeei* Hayat

H. Mandible, ♀

I. Head in facial view, ♀

J. Antenna, ♀

K. Propodeum and part of thorax in dorsal view, ♀

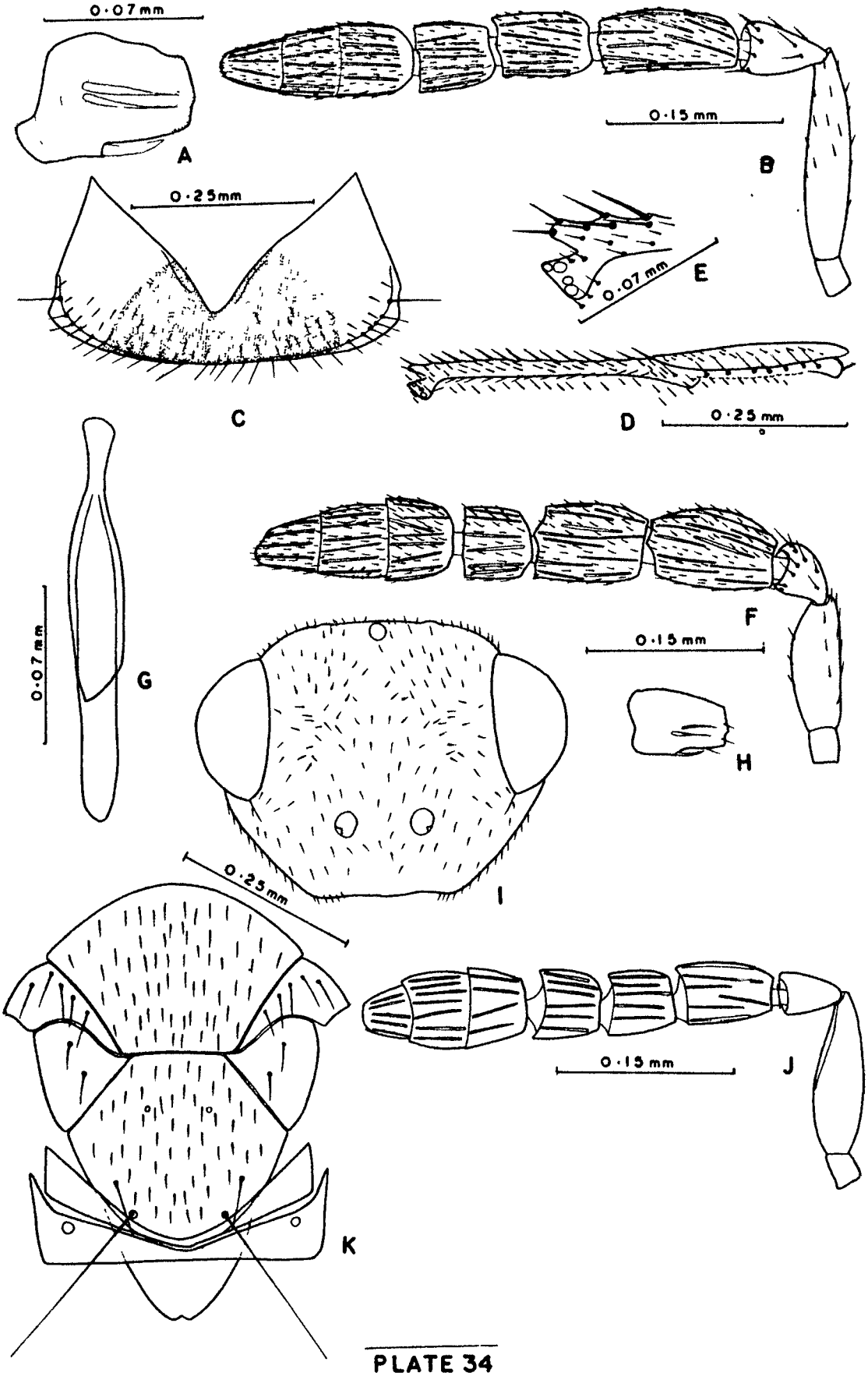
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PLATE 34

characters of this genus have been given in detail by Compere (1936), De Santis (1948) and Nikol'skaya and Yasnosh (1966). The present writer suggested some new generic characters which are as follows: Pronotum formed of one piece and without membranous area in middle, anterior margin deeply concave in middle, posterior margin straight, posterior submarginal ridge present (Pl. 35, fig. E); first valvifers triangular with basal and apical angles at different levels (Pl. 35, fig. K); basal part of second valvifers short (Pl. 35, fig. L); third valvulae short, movably articulated with second valvifers (Pl. 35, fig. L); outer plates of ovipositor narrow at base, widened beyond basal one-fourth (Pl. 35, fig. M); subgenital plate narrow, posterior margin with a wide notch in middle (Pl. 35, fig. N); male genitalia with gonobase shorter than aedeagus, aedeagus long, digitus absent (Pl. 35, fig. P).

Aneristus Ceroplastae Howard

(Plate 35, figs. A-P)

Aneristus ceroplastae Howard, 1895, Canad. Ent., 27: 351.
Coccophagus orientalis Howard, 1896, Proc. U.S. nat. Mus., 18:633.
Prococcophagus orientalis Timberlake, 1917, Proc. Hawaiian. ent. Soc., 3: 404.

Recently, Hayat (1974 c) synonymized the species

PLATE 35

Figs. A-P. *Aneristus ceroplastae* Howard

A. Mandible, ♀

B. Maxillary and labial palpi, ♀

C. Antenna, ♀

D. Propodeum and part of thorax in dorsal view, ♀

E. Pronotum, ♀

F. Fore wing, ♀

G. Part of fore wing venation, ♀

H. Part of fore leg, ♀

I. Part of middle leg, ♀

J. Part of hind leg, ♀

K. First valvifer, ♀

L. Second valvifer and third valvula, ♀

M. Outer plate of ovipositor, ♀

N. Subgenital plate, ♀

O. Antenna, ♂

P. Genitalia, ♂

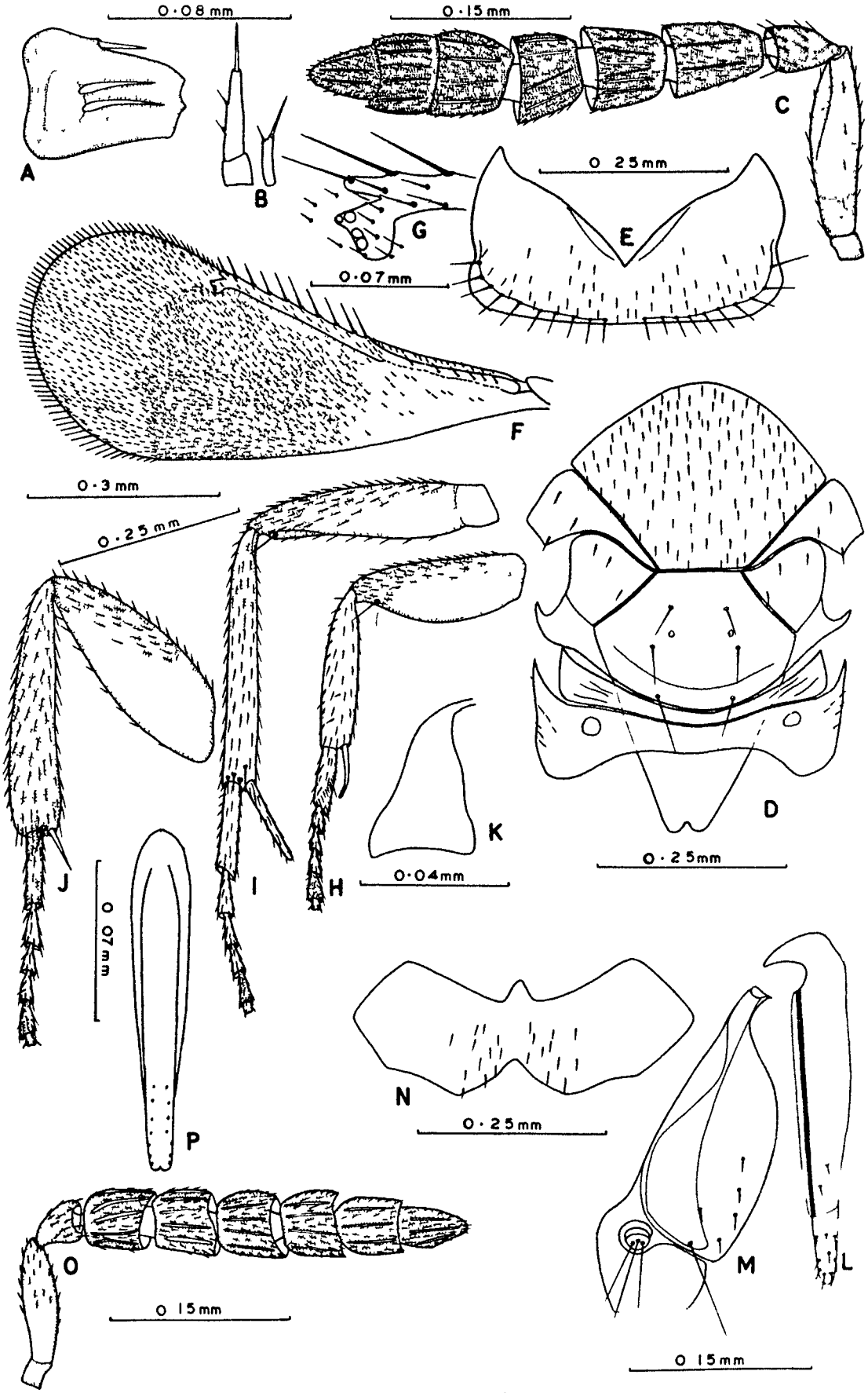
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PLATE 35

Coccophagus diaspidis Agarwal, Coccophagus citri Agarwal and Coccophagus delhiensis Subba Rao and Rai with Aneristus ceroplastae Howard.

Material examined.- 6 ♀, 1 ♂, INDIA: Uttar Pradesh, Aligarh, ex Coccid on Ficus sp., 6.x.1975 (M. Younus Khan).

10. Genus Physcus Howard

Physcus Howard, 1895, Tech. Ser. U.S. Dept. Agr., Bur. Ent., 1: 43.

Type-species: Coccophagus varicornis Howard (Monobasic).

The genus Physcus was proposed by Howard (1895 a) for the species Coccophagus varicornis Howard. Hayat (1971 a) proposed new generic characters of outer plates of ovipositor and subgenital plate which are confirmed as stable. The present writer suggested some additional generic characters which are as follows: Pronotum formed of one continuous piece and without membranous area in middle, anterior margin concave, posterior margin with a submarginal ridge which is indistinct in middle (Pl. 36, fig. C); first valvifers triangular with basal and apical angles at different levels (Pl. 36, fig. M); anterior margin of basal part of second valvifers semicircular, third valvulae movably articulated with second valvifers (Pl. 36, fig. N).

Hayat (1971 a) in his key to Indian species of Physcus gave the character i.e. "mesoscutum with longitudinal reticulations" for the species Physcus reticulatus Compere and Annecke. A careful consultation of the original description given by Compere and Annecke (1961) for P. reticulatus and also study of Indian material of P. reticulatus show that mesoscutum is having transverse reticulations. The author discussed the same with Dr. Hayat, the later agreed with him that mesoscutum is having transverse reticulations. Hayat's (1971 a) key has been revised and also accommodated Physcus aligarhensis Hayat.

Key to Indian species of Physcus Howard,
based on females

1. Body in major part black or brown. 2

__ Body yellow; funicle segments first and second dark, third white. . . . . P. flaviceps Girault & Dodd

2. Funicle segment first dark brown, second yellow or brown, third yellow. 3

__ Funicle segments yellow; scape infuscated, four and a half times as long as wide, about as long as club; pedicel one and a half times as long as wide, shorter than first funicle segment; funicle segments 1-3 subequal, each more than one and a half times as long as wide; club four times as long as wide. . . . .P. aligarhensis Hayat

3. Funicle segment first brown, second and third yellow. .4
__ Funicle segment first dark brown, second light brown, third yellowish white. . . . . .P. albipodus Agarwal
4. Funicle segments twice as long as wide; mesoscutum with faint hexagonal reticulations; postmarginal vein absent; legs yellow. . . . . .P. comperei Hayat
__ Funicle segments less than twice as long as wide (Pl. 36, fig. B); mesoscutum with transverse reticulations (Pl. 36, fig. E); postmarginal vein present (Pl. 36, fig. I); legs colourless or largely so. . . . . .P. reticulatus Compere & Annecke

Physcus reticulatus Compere and Annecke

(Plate 36, figs. A-P)

Physcus reticulatus Compere and Annecke, 1961, J. ent. Soc. S. Afr., 24: 17.

Physcus reticulatus Compere and Annecke; Hayat, 1971, Bull. Ent., 12: 118.

The present writer proposed some additional specific characters which are as follows: Pronotum formed of one piece and without membranous area in middle, anterior margin concave, posterior margin straight with a submarginal ridge which is indistinct in middle, bearing 6 pairs of setae (fig. C); first valvifers triangular with basal and apical angles at different

PLATE 36

Figs. A-P. Physcus reticulatus Compere and Annecke

A. Mandible, ♀

B. Antenna, ♀

C. Pronotum, ♀

D. Propodeum and part of thorax in dorsal view, ♀

E. Sculpture of scutum, ♀

F. Sculpture of scutellum, ♀

G. Sensoria of scutellum, ♀

H. Fore wing, ♀

I. Part of fore wing venation, ♀

J. Part of fore leg, ♀

K. Part of middle leg, ♀

L. Part of hind leg, ♀

M. First valvifer, ♀

N. Second valvifer and third valvula, ♀

O. Outer plate of ovipositor, ♀

P. Subgenital plate, ♀

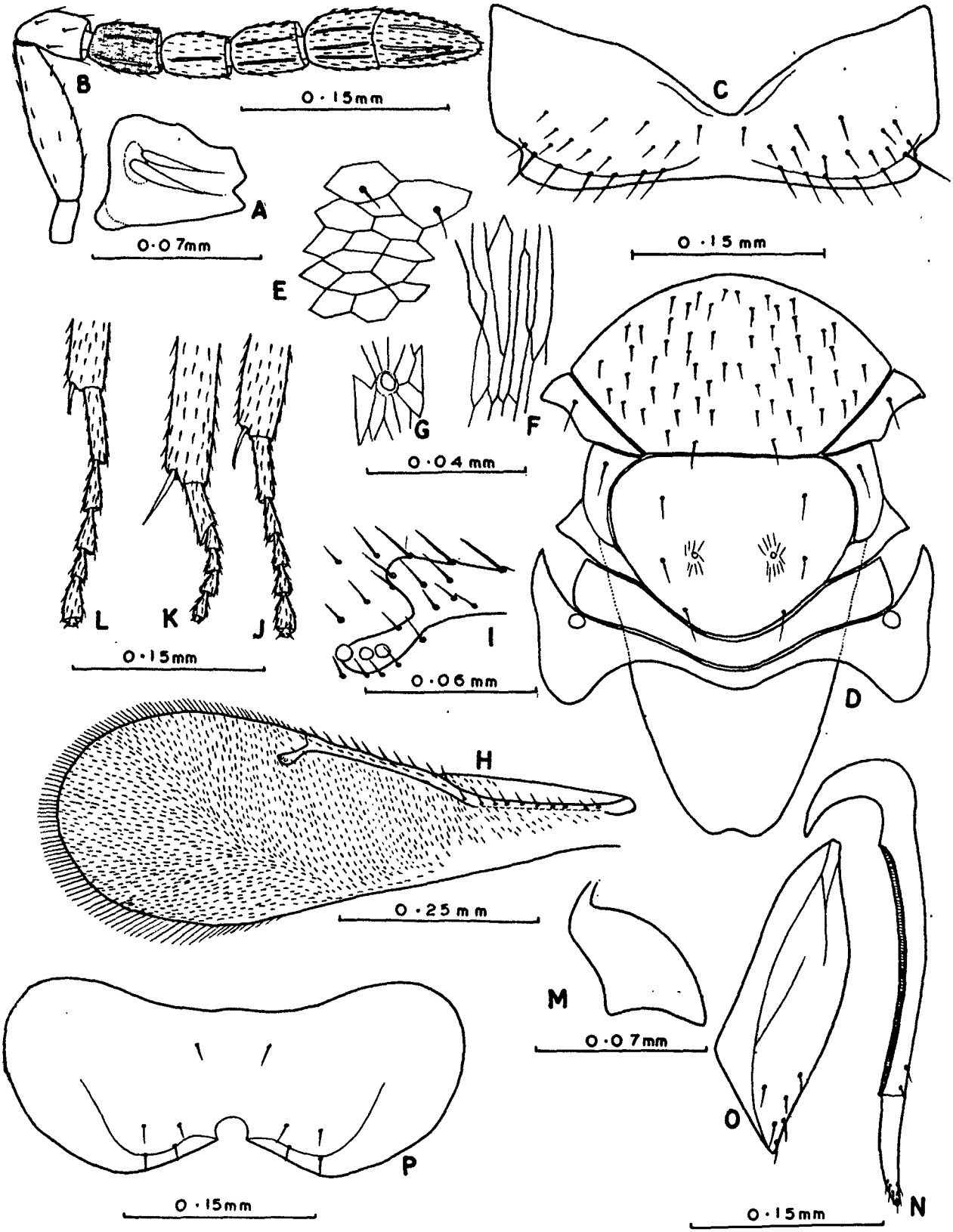
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PLATE 36

levels basal and outer margins slightly concave, inner margin convex (fig. M); anterior margin of basal part of second valvifers semicircular, third valvulae four times as long as wide, one-third the length of second valvifers (fig. N).

Material examined.- 5 ♀, INDIA: Rajasthan, Jaipur, ex Coccidohystrix insolitus (Green) on Solanum melongena Linn., 28.ix.1975 (M. Younus Khan).

11. Genus Ablerus Howard

Ablerus Howard, 1894, Insect Life, 7: 7.
Type-species: Centrodora clisiocampae Ashmead (Monobasic).

The genus Ablerus was proposed by Howard (1894 c) for the species Centrodora clisiocampae Ashmead and placed it in the subfamily Aphelininae. Ashmead (1904 a) placed the genus Ablerus Howard along with a group of genera having 5-jointed tarsi in the tribe Aphelinini. This placement was accepted by Howard (1907) and Mercet (1912). De Santis (1946, 1948) and Ferrière (1965) placed it in the subfamily Coccophaginae on the basis of absence of speculum in fore wings. Nikol'skaya and Yasnosh (1966) discarded earlier workers and placed it in their newly proposed subfamily Azotinae on the basis of having 7-segmented antennae, 1-segmented club and short and wide male genitalia. However, Shafee and Khan (1978) dropped the

subfamily Azotinae from Aphelinidae and reshifted the genus Ablerus Howard to the subfamily Coccophaginae.

The genus is characterized as follows: Antennae 7-segmented; fore wings without speculum, disc without long and thick setae; pronotum formed of one piece and without membranous area in middle, anterior and posterior margins concave with submarginal ridge along each lateral margin (Pl. 37, fig. B; Hayat, 1974 b, fig. 12); first valvifers semicircular with basal and apical angles in one plane (Pl. 37, fig. D); anterior margin of basal part of second valvifers much curved, U-shaped; third valvulae long, more than one-third the length of second valvifers (Pl. 37, fig. E); subgenital plate broad, posterior margin with a notch in middle, sides of notch followed by long wavy ridges, mid-longitudinal groove and antero-lateral apodemes distinct (Pl. 37, fig. G; Hayat, 1974 b, fig. 15).

Ablerus aonidiellae Hayat

(Plate 37, figs. A-G)

Ablerus aonidiellae Hayat, 1974, J. Bomb. nat. Hist. Soc., 71: 68.

The present writer proposed some additional specific characters which are as follows: First valvifers semicircular with basal and apical angles in same plane, basal and outer margin straight, inner margin semicircular (fig. D); anterior

margin of basal part of second valvifers much curved, U-shaped, third valvulae long seven times as long as wide, less than one-half the length of second valvifers (fig. E); outer plates of ovipositor narrow at base gradually widened apically (fig. F).

Material examined.- 2 ♀, INDIA: Uttar Pradesh, Aligarh, University Botanical Garden, ex Aonidiella orientalis (Newst.) on Psidium guajava L., 10.ix.1975 (M. Younus Khan).

12. Genus Azotus Howard

Azotus Howard, 1898, Proc. Ent. Soc. Wash., 4: 138.
Type-species: Azotus marchali Howard (Monobasic).
Dimacrocerus Brèthes, 1914, Nunquam Otiosus, Buenos Aires, p.4.
Type-species: Dimacrocerus platensis Brèthes (Monobasic).

The genus Azotus was proposed by Howard (1898) for the species Azotus marchali Howard and placed it in the subfamily Aphelininae. Ashmead (1904 a) placed the genus Azotus Howard along with a group of genera having 5-jointed tarsi in the tribe Aphelinini. This placement was followed by Howard (1907) and Mercet (1912). De Santis (1946, 1948) and Ferrière (1965) placed it in the subfamily Coccophaginae on the basis of absence of speculum in fore wings. Nikol'skaya and Yasnosh (1966) discarded earlier workers and placed it in their newly proposed subfamily Azotinae on the basis of having 7-segmented antennae, 1- segmented club. However, Shafee and Khan (1978)

dropped the subfamily Azotinae from Aphelinidae and reshifted the genus Azotus Howard to the subfamily Coccophaginae.

The genus is characterized as follows: Antennae 7-segmented, club 1-segmented; fore wings without speculum, disc with groups of long and thick setae; pronotum formed of one piece and without membranous area in middle with submarginal ridge along each lateral margin, anterior and posterior margins concave (Pl. 37, fig. I; Alam, 1956, fig. 31; Agarwal, 1964 b, fig. 17); first valvifers semicircular with basal and apical angles in one plane (Pl. 37, fig. K; Alam, 1956, fig. 35 A; Zinna, 1962, Pl. 35, fig. 3); anterior margin of basal part of second valvifers much curved U-shaped; third valvulae long more than one-third the length of second valvifers (Pl. 37, fig. L; Zinna, 1962, Pl. 35, fig. 2); subgenital plate broad, posterior margin with a notch in middle, sides of notch followed by wavy ridges, mid-longitudinal groove and apodemes distinct (Pl. 37, fig. N; Agarwal, 1964 b, fig. 19).

Azotus bimaculatus Khan and Shafee

(Plate 37, figs. H-N)

Azotus bimaculatus Khan and Shafee, 1976, Geobios, 3: 173.

The present writer proposed some additional specific characters which are as follows: Outer plates of ovipositor more or less of uniform width (fig. M); subgenital plate broad,

PLATE 37

Figs. A-G. *Ablerus aonidiellae* Hayat

A. Antenna, ♀

B. Pronotum, ♀

C. Fore wing, ♀

D. First valvifer, ♀

E. Second valvifer and third valvula, ♀

F. Outer plate of ovipositor, ♀

G. Subgenital plate, ♀

Figs. H-N. *Azotus bimaculatus* Khan and Shafee

H. Antenna, ♀

I. Pronotum, ♀

J. Fore wing, ♀

K. First valvifer, ♀

L. Second valvifer and third valvula, ♀

M. Outer plate of ovipositor, ♀

N. Subgenital plate, ♀

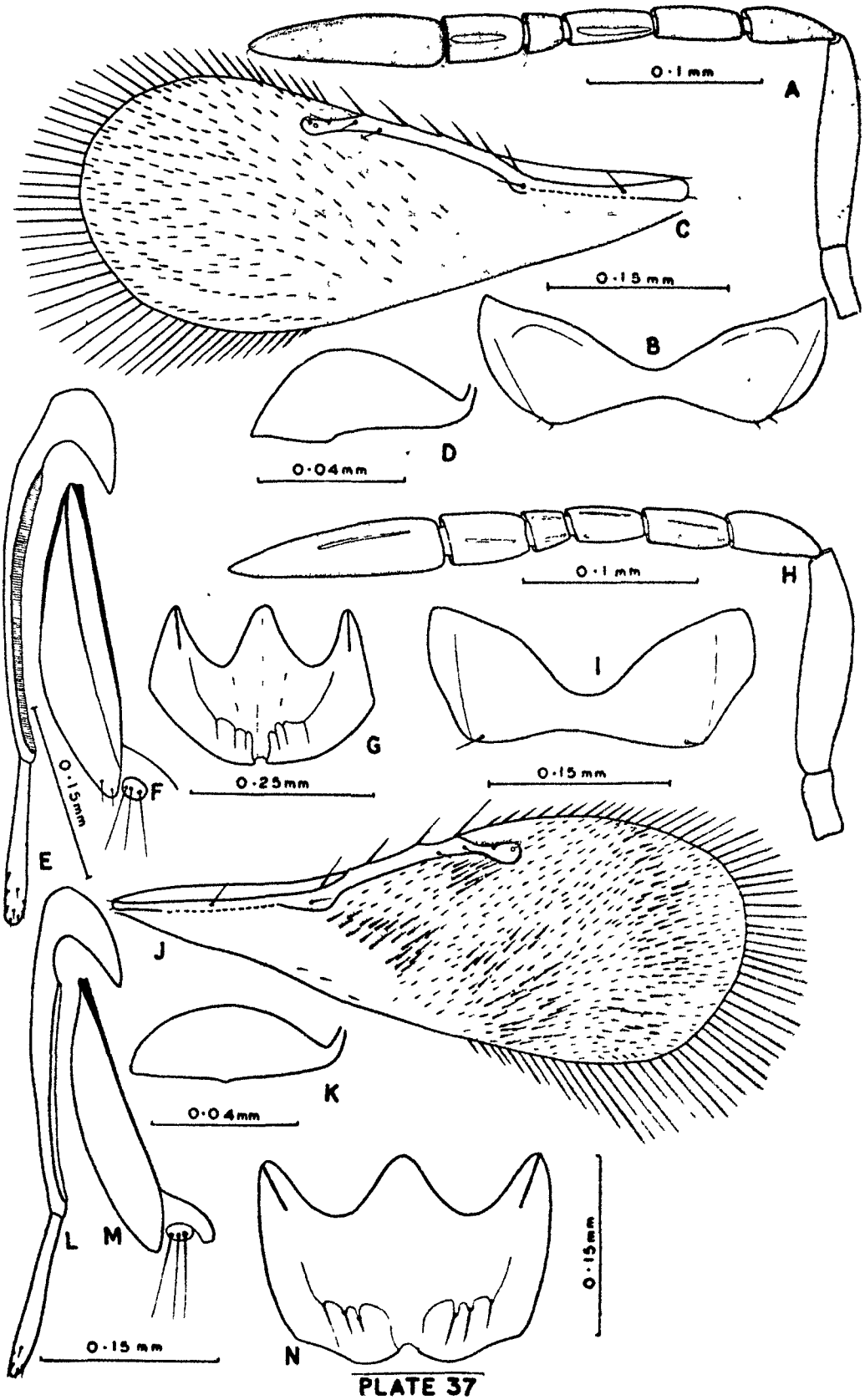
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PLATE 37

posterior margin with a notch in middle, sides of notch followed by wavy ridges, mid-longitudinal groove and apodemes distinct (fig. N).

Material examined.- 2 ♀, INDIA: Uttar Pradesh, Aligarh, University Campus, ex Aleurolobus barodensis Mask., on Saccharum officinarum Linn., 10.ix.1975 (M. Younus Khan).

TRIBE: PROSPALTELLINI NIKOL'SKAYA AND YASNOSH

Nikol'skaya and Yasnosh (1966) proposed new subfamily Prospaltellinae for a group of genera having 6 to 8-segmented antennae, 2 to 3-segmented club, long and narrow male genitalia. Recently, Shafee and Khan (1978) demoted the subfamily Prospaltellinae Nikol'skaya and Yasnosh to the rank of tribe Prospaltellini and attributed only those genera to it having 5-jointed tarsi, absence of speculum in fore wings and presence of membranous area in middle of pronotum. Further, they reshifted the genera Artas Howard, Bardylis Howard, Pteroptrix Westwood, Aphelosoma Nikol'skaya, Archenomus Howard and Hispaniella Mercet having 4-jointed tarsi to the subfamily Pteroptricinae. The present writer confirmed the stability of tribal characters viz. "Pronotum formed of two separate pieces and with membranous area in middle". These characters

apply well on the genera: Prospaltella Ashmead (Pl. 38, fig. C; Nikol'skaya & Yasnosh, 1966, fig. 487; Shafee, 1974, fig. 8) and Trichaporus Foerster (Pl. 39, figs. B & C).

13. Genus Prospaltella Ashmead

Prospalta Howard, 1894, Insect Life, 7: 6. (Preoccupied by Prospalta Walker, 1857, in Lepidoptera).

Type-species: (Prospalta murtfeldtii Howard) = Prospaltella murtfeldtae (Howard) (Monobasic).

Prospaltella Ashmead, 1904, Proc. Ent. Soc. Wash., 6: 126.

Mimatomus Cockerell, 1911, Ent. News, 22: 464.

Type-species: Mimatomus peltatus Cockerell (Monobasic).

Ashmead (1904 b) proposed new name Prospaltella for Prospalta Howard, since the later was preoccupied by a genus proposed by Walker (1857) in Lepidoptera. The species belonging to this genus are generally parasite of white flies and Coccids. The distinguishing characters of this genus have been given in detail by Ferrière (1965) and Nikol'skaya and Yasnosh (1966). The present writer suggested some new generic characters which are as follows: Pronotum formed of two separate pieces and with a membranous area in middle, anterior margin deeply concave, posterior margin with a submarginal ridge which is indistinct in middle (Pl. 38, fig. C; Nikol'skaya & Yasnosh, 1966, fig. 487; Shafee, 1973, fig. 8);

first valvifers triangular with basal and apical angles at different levels (Pl. 38, figs. G & O); third valvulae movably articulated with second valvifers (Pl. 38, figs. H & P).

The present writer divided the genus Prospaltella Ashmead into two subgenera Prospaltella S. Str. and Neoprospaltella subgen. n. on the basis of shape of last abdominal tergum, exserted and unexserted condition of ovipositor. The two subgenera differentiated by the following key characters.

Key to subgenera of Prospaltella Ashmead, based on females

1. Last abdominal tergum small, not enclosing the ovipositor; ovipositor concealed (Pl. 38, fig. D; De Santis, 1948, fig. 45; Nikol'skaya & Yasnosh, 1966, fig. 115) . . . . . .Prospaltella S. str.

__ Last abdominal tergum well developed, forming a tube apically, enclosing the ovipositor; ovipositor much exserted (Pl. 38, fig. M). . .Neoprospaltella Subgen. n.

Prospaltella (Prospaltella) breviclavata Shafee
(Plate 38, figs. A-J)

Prospaltella breviclavata Shafee, 1973, Entomophaga, 18: 251.

The present writer proposed some additional specific characters which are as follows: Mandibles with thick and

conical peg (fig. A); Pronotum with posterior margin straight, posterior submarginal ridge bearing 6 pairs of setae (fig. C); first valvifers triangular with basal margin concave, inner and outer margins straight (fig. G); anterior margin of basal part of second valvifers not curved, third valvulae two and a half times as long as wide, less than one-half the length of second valvifers (fig. H); outer plates of ovipositor narrow at base, broadly truncated at apex (fig. I); male genitalia long, gonobase shorter than aedeagus, digitus absent (fig. J).

Material examined.- 2 ♀, 1 ♂, INDIA: Uttar Pradesh, Pantnagar, ex Neomaskellia bergii Signoret on Saccharum sp., 12.vi.1976 (M. Younus Khan).

Prospaltella (Neoprospaltella) terebrator Shafee

(Plate 38, figs. K-S)

Prospaltella terebrator Shafee, 1974, Entomophaga, 19: 36.

The present writer proposed some additional specific characters which are as follows: Pronotum with posterior margin concave, posterior submarginal ridge bearing 8 pairs of setae (fig. L); first valvifers triangular with margins straight (fig. O); anterior margin of basal part of second valvifers much curved U-shaped (fig. P); third valvulae eight times as long as wide, more than one-half the length of second valvifers (fig. P); outer plates of ovipositor long, narrow at

PLATE 38

Figs. A-J. *Prospaltella breviclavata* Shafee

A. Mandible, ♀

B. Antenna, ♀

C. Pronotum, ♀

D. Abdomen and thorax except pronotum in dorsal view, ♀

E. Fore wing, ♀

F. Part of fore wing venation, ♀

G. First valvifer, ♀

H. Second valvifer and third valvula, ♀

I. Outer plate of ovipositor, ♀

J. Genitalia, ♂

Figs. K-S. *Prospaltella terebrator* Shafee

K. Antenna, ♀

L. Pronotum, ♀

M. Thorax and abdomen in dorsal view, ♀

N. Part of fore wing venation, ♀

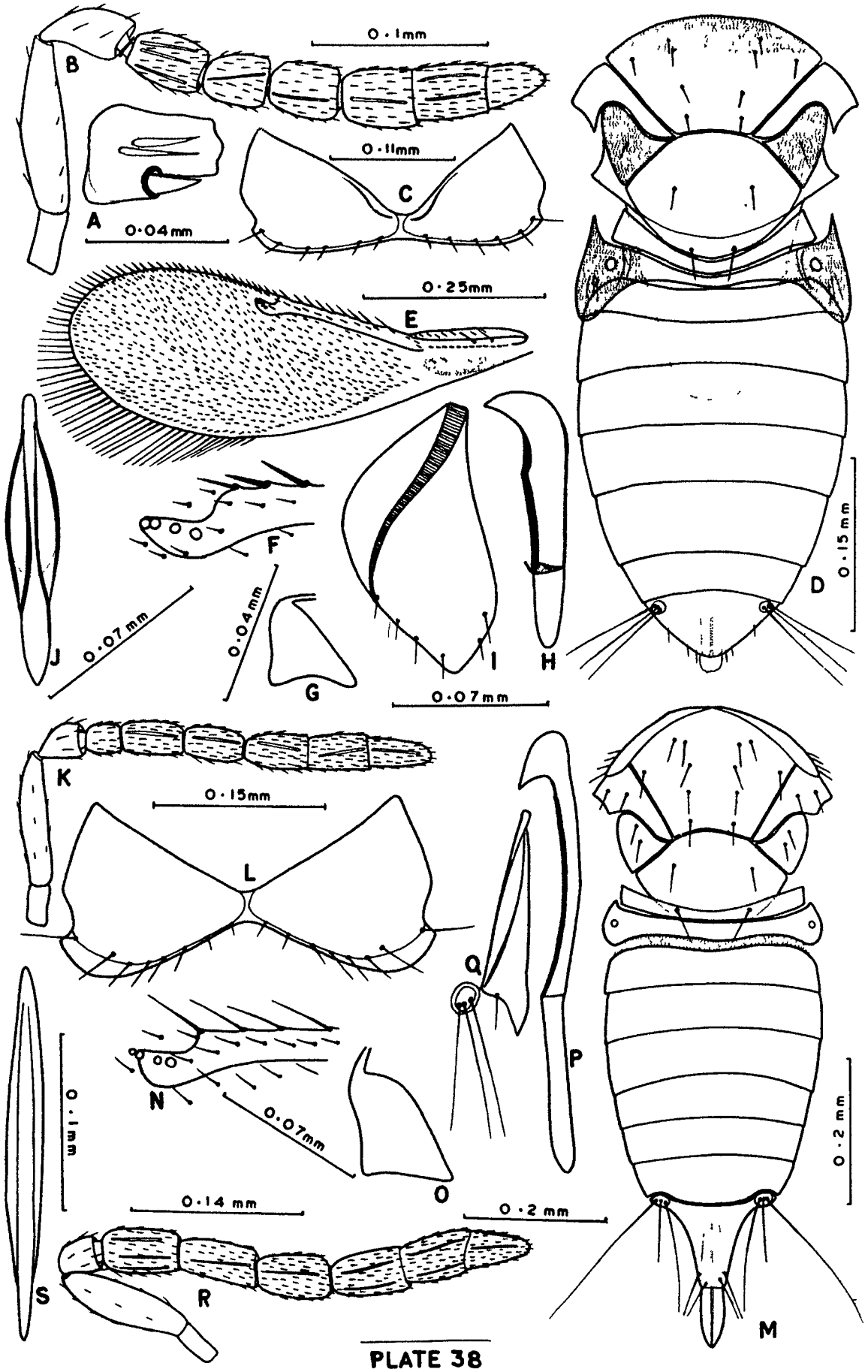
O. First valvifer, ♀

P. Second valvifer and third valvula, ♀

Q. Outer plate of ovipositor, ♀

R. Antenna, ♂

S. Genitalia, ♂


B
0·1mm
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C
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E
0·25mm
F
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0·07mm
0·04mm
G
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H
0·07mm
D
0·15mm
K
0·15mm
L
Q
P
N
0·07mm
O
0·1mm
0·14 mm
0·2 mm
S
R
M
0·2 mm

PLATE 38

base, gradually widened at apex (fig. Q); male genitalia long and narrow with gonobase as long as aedeagus, digitus absent (fig. S).

Material examined.- 1 ♀, 1 ♂, INDIA: Andhra Pradesh, Guntur, ex Neomaskellia bergii Signoret on grass, 10.xi.1967 (S. Adam Shafee).

14. Genus Trichaporus Foerster

Trichaporus Foerster, 1856, Hym. Stud., 2: 84.
Type-species: Encarsia partenopea Masi.

The genus Trichaporus was proposed by Foerster(1856). The type species is Encarsia partenopea Masi. The species belonging to this genus are generally parasites of white flies. The distinguishing characters of this genus have been given in detail by Peck et al. (1964) and Nikol'skaya and Yasnosh (1966). The present writer suggested some new generic characters which are as follows: Pronotum formed of two separate pieces and with a membranous area in middle, anterior margin deeply concave, posterior margin with a submarginal ridge which is indistinct in middle (Pl. 39, fig. B & O); first valvifers triangular with basal and apical angles at different levels (Pl. 39, figs. H, P. & V); anterior margin of basal part of second valvifers not much curved, semi-circular; third valvulae movably articulated with second valvifers (Pl. 39, figs. I, Q & W); outer plates of ovipositor narrow at

base broadly truncated at apex (Pl. 39, figs. J,R & X); subgenital plate of uniform width, posterior margin with a notch in middle (Pl. 39, fig. K). Male genitalia long and narrow with gonobase about as long as aedeagus, digitus absent (Pl. 39, fig. M; Nikol'skaya & Yasnosh, 1966, fig. 473).

The genus Trichaporus Foerster is recorded for the first time from India. Among the three species collected two have been described as new to science under the names T. nigrocoxalis sp. n. and T. longicornis sp. n. and one species T. partenopeus (Masi) has been reported for the first time from India. A key to the three Indian species of Trichaporus Foerster is given.

Key to Indian species of Trichaporus Foerster, based on females

1. Thorax completely yellowish brown (Pl. 39, fig. C); scape longer than basal two funicle segments together; first funicle segment shorter than second; first valvifers not much elongated (Pl. 39, figs. H & P). 2

__ Thorax yellowish brown except one large patch on scutum and two small patches on scutellum which are dark brown (Pl. 39, fig. U; Nikol'skaya & Yasnosh, 1966, fig. 468); scape as long as basal two funicle segments together; funicle segments 1-4 subequal in length (Pl. 39, fig. T; Nikol'skaya & Yasnosh, 1966, fig. 469); first valvifers

like an elongated triangle (Pl. 39, fig. V); third valvulae short, slightly more than three times as long as wide (Pl. 39, fig. W). . . . . .T. partenopeus (Masi)

2, Coxae yellow; first funicle segment twice as long as wide; funicle segments 2-4 gradually increasing in length distad, each more than two and a half times as long as wide; club five times as long as wide; scutum with 3 pairs of setae; third valvulae five times as long as wide (Pl. 39, fig. Q). . . T. longicornis sp. n.

__ Coxae dark; first funicle segment one and a half times as long as wide; funicle segments 2-4 subequal in length, each about twice as long as wide; club four times as long as wide; scutum with 4 pairs of setae; third valvulae four times as long as wide (Pl. 39, fig. I). . . . . .T. nigrocoxalis sp. n.

Trichaporus nigrocoxalis sp. n.

(Plate 39, figs. A-M)

Female.

Head.- Yellowish, wider than long in facial view; frontovertex about twice as wide as long; ocelli red, arranged in obtuse triangle, lateral ocelli twice their own diameters from orbital and occipital margins separately; antennae inserted at lower level of eyes; malar space about as long as eye width; maxillary and labial palpi 2 and 1-segmented respectively.

Antennae (fig. A).- Yellowish, 8-segmented; scape cylindrical, five times as long as wide, longer than basal two funicle segments together; pedicel twice as long as wide, distinctly longer than first funicle segment; funicle 4-segmented; first funicle segment shortest, one and a half times as long as wide; segments 2-4 subequal in length, each about twice as long as wide; club 2-segmented, four times as long as wide, slightly longer than preceding two funicle segments together.

Thorax (fig. C).- Yellowish brown; pronotum formed of two separate pieces and with a membranous area in middle , anterior margin deeply concave, posterior margin with a submarginal ridge which is indistinct in middle and bearing 7 pairs of setae (fig. B); scutum one and a half times as wide as long and with 4 pairs of setae; each axilla and parapside with 1 and 2 setae respectively; scutellum twice as wide as long and with 2 pairs of setae; scutum and scutellum with reticulate sculpture (figs. D & F), parapsides with strigose sculpture (fig. E); mesopostphragma well developed.

Fore wings.- Hyaline, three times as long as wide (0.61: 0.2 mm); costal cell long and narrow with 9 small setae; submarginal as long as marginal vein and with 3 and 6 setae respectively; postmarginal vein rudimentary; stigmal vein short (fig. G); marginal fringe short, spaced by a distance equal to one-fourth their length.

Hind wings.- Hyaline, about five and a half times as long as wide; marginal fringe length more than the greatest wing width.

Legs.- Orange yellow except coxae which are dark; tarsi 5-jointed.

Abdomen.- Orange yellow except base of dorsum infuscated; ovipositor concealed; first valvifers triangular, not elongated, with basal and apical angles at different levels, basal margin slightly concave (fig. H); anterior margin of basal part of second valvifers slightly curved, semicircular, third valvulae four times as long as wide, less than one-half the length of second valvifers (fig. I); outer plates of ovipositor narrow at base, broadly truncated at apex (fig. J); subgenital plate more or less of uniform width, posterior margin with a notch in middle (fig. K).

Female length: 0.72 mm.

Male.

Resembles female except in the following characters:

Funicle segments 1-3 subequal in length, each more than twice as long as wide, fourth two and a half time as long as wide, longer than preceding funicle segments separately; club shorter than preceding two funicle segments together (fig. L);

male genitalia long and narrow, gobobase about as long as aedeagus, digitus absent (fig. M).

Male length : 0.65 mm.

Holotype ♀, INDIA: Uttar Pradesh, Aligarh University Agricultural farm, ex Aleyrodes on Weed plant, 3.iii.1976 (M. Younus Khan).

Paratypes. 5 ♀, 2 ♂ (Same data as holotype).

Trichaporus longicornis sp. n.

(Plate 39, figs. N-S)

Female.

Head.- Yellowish, wider than long in facial view; frontovertex about twice as wide as long; ocelli red, arranged in obtuse triangle, lateral ocelli more than their own diameters from orbital margin and their own diameters from occipital margin; antennae inserted at lower level of eyes; malar space about as long as eye width; maxillary and labial palpi 2 and 1-segmented respectively.

Antennae (fig. N).- Yellowish, 8-segmented; scape cylindrical, five times as long as wide, longer than basal two funicle segments together; pedicel twice as long as wide,

distinctly longer than first funicle segment; funicle 4-segmented; first funicle segment shortest, twice as long as wide, segments 2-4 gradually increasing in length distad, each more than two and a half times as long as wide; club 2-segmented, five times as long as wide, longer than preceding two funicle segments together.

Thorax.- Yellowish brown; pronotum formed of two separate pieces, anterior margin deeply concave, posterior margin with a submarginal ridge which is indistinct in middle and bearing 7 pairs of setae (fig. 0); scutum wider than long with 3 pairs of setae; each axilla and parapside with 1 and 2 setae respectively; scutellum about twice as wide as long and with 2 pairs of setae; scutum and scutellum with reticulate sculpture, parapsides with strigose sculpture.

Fore wings.- Hyaline, less than three times as long as wide; costal cell long with 12 small setae; submarginal vein about as long as marginal vein and with 3 and 8 setae respectively; postmarginal vein absent; marginal fringe spaced by a distance equal to one-sixth their length.

Hind wings.- Hyaline, about five times as long as wide; marginal fringe length more than the wing width.

Legs.- Yellowish; tarsi 5-jointed.

Abdomen.- Yellowish except base slightly infuscated; ovipositor concealed; first valvifers triangular, not elongated, with basal and apical angles at different levels, basal margin slightly concave (fig. P); anterior margin of basal part of second valvifers slightly curved, semicircular, third valvulae five times as long as wide, less than one-half the length of second valvifers (fig. Q); outer plates of ovipositor narrow at base, broadly truncated at apex (fig. R).

Female length : 0.67 mm.

Male.

Resembles females except in the following characters:

Scape less than four times as long as wide; pedicel less than twice as long as wide; funicle segments first, third and fourth subequal in length, each slightly shorter than second; club shorter than preceding two funicle segments together (fig. S).

Holotype ♀, INDIA: Uttar Pradesh, Aligarh, University Agricultural farm, ex Aleyrodes on Weed plant, 24.vi.1976 (M. Younus Khan).

Paratypes. 2 ♀, 1 ♂ (same data as holotype).

Trichaporus partenopeus (Masi)

(Plate 39, figs. T-X)

Trichaporus partenopeus (Masi); Nikol'skaya and Yasnosh, 1966, Opred. Faune SSSR., 91: 267.

The present writer proposed some additional specific characters which are as follows: First valvifers like an elongated triangle, basal margin concave (fig. V); anterior margin of basal part of second valvifers slightly curved, semicircular (fig. W); third valvulae slightly more than three times as long as wide, less than one-half the length of second valvifers (fig. W); outer plates of ovipositor narrow at base, broadly truncated at apex (fig. X).

Material examined.- 2 ♀, 1 ♂, INDIA: Uttar Pradesh, Aligarh, University Agricultural farm, ex Aleyrodes on Weed plant, 4.v.1976. (M. Younus Khan).

PLATE 39

Figs. A-M. Trichaporus nigrocoxalis sp.n.

A. Antenna, ♀

B. Pronotum, ♀

C. Propodeum and part of thorax in dorsal view, ♀

D. Sculpture of scutum, ♀

E. Sculpture of Prapside, ♀

F. Sculpture of Scutellum, ♀

G. Fore wing venation, ♀

H. First valvifer, ♀

I. Second valvifer and third valvula, ♀

J. Outer plate of ovipositor, ♀

K. Subgenital plate, ♀

L. Antenna, ♂

M. Genitalia, ♂

Figs. N-S. Trichaporus longicornis sp.n.

N. Antenna, ♀

O. Pronotum, ♀

P. First valvifer, ♀

Q. Second valvifer and third valvula, ♀

R. Outer plate of ovipositor, ♀

S. Antenna, ♂

Figs. T-X. Trichaporus partenopeus (Masi)

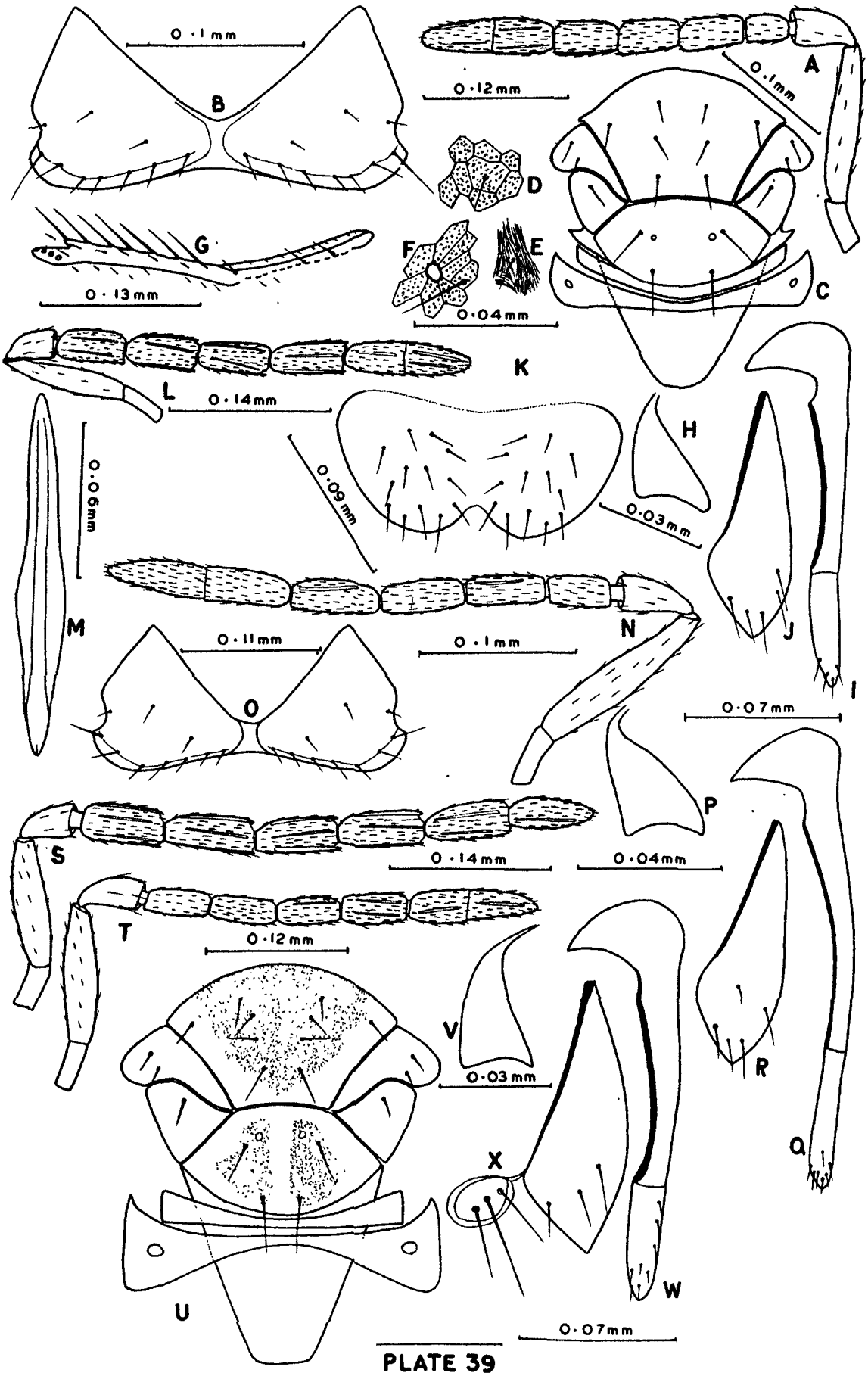
T. Antenna, ♀

U. Propodeum and part of thorax in dorsal view, ♀

V. First valvifer, ♀

W. Second valvifer and third valvula, ♀

X. Outer plate of ovipositor, ♀


0·1mm
B
0·12mm
A
0·1mm
D
G
F
E
0·13mm
0·04mm
C
K
L
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J
I
0·11mm
0·1mm
O
0·07mm
P
S
0·14mm
0·04mm
T
0·12mm
V
0·03mm
R
Q
X
U
W
0·07mm

PLATE 39

PART III

VI. FAMILY: TRICHOGRAMMATIDAE WALKER

INTRODUCTION

Westwood (1833 a) and Haliday (1833) simultaneously proposed the genera Trichogramma and Calleptiles respectively. The former is generally considered as type of the family Trichogrammatidae because of the fact that this genus was described one month earlier than Calleptiles Haliday. Westwood (1840) placed his genus Trichogramma in the subfamily Encyrtides (with Calleptiles Haliday as its synonym). Walker (1851) established the tribe Trichogrammini and proposed three genera, Chaetostricha, Brachista and Oligosita in it. Foerster (1856) in his "Hymenopterologische Studien" for the first time properly defined the family under the name Trichogrammatoidae. He proposed three genera, Centrobia, Lathromeris and Asynacta in this family and also gave a key to genera known to him. The same author proposed the genus Poropoea in 1851. Thomson (1876) again demoted the family to the rank of tribe Trichogrammina.

Ratzeburg (1852), Lubbock (1864), Packard (1872), Westwood (1879), Howard (1897) and Aurivilius (1897) separately proposed the genera, Ophioneurus, Prestwichia, Pentarthron, Aprobosca, Paracentrobia and Oophthora respectively under the family Trichogrammatidae.

Ashmead (1904 a) gave full synopsis of the family Trichogrammidae which he divided into two subfamilies, Trichogramminae and Oligositinae, mainly based on regular or irregular arrangement of setae on disc of fore wings. He proposed the genera Westwoodella and Xanthoatomus in the subfamilies Oligositinae and Trichogramminae respectively.

Schmiedeknecht (1909) recognized Trichogramminae as subfamily of Chalcididae and divided it into two tribes, Trichogrammini and Oligositini. Further, he provided key to genera of each tribe.

Girault (1912) adopted the family name as Trichogrammatidae and divided it into two subfamilies, Chaetostrichinae and Trichogrammatinae based on the curved and uncurved condition of wing venation. He further divided the subfamilies into tribes as follows: Chaetostrichinae into two tribes, Chaetostrichini and Lathromerini on the basis of presence or absence of funicle; Trichogrammatinae into two tribes, Trichogrammatini and Poropaeini principally based on the shape of marginal vein. Lastly, he provided a key to genera of each tribe and also gave a complete catalogue of genera and species of the family Trichogrammatidae. The same author (1913 a) for the first time gave historical review of the family Trichogrammatidae. He followed Ashmead (1904 a) in dividing the family Trichogrammatidae into two subfamilies: Trichogramminae and Oligositinae on the basis of regular or

irregular arrangement of setae on disc of fore wings. Further, he provided a key to genera under each subfamily.

Mani (1938) used the family name as Trichogrammidae and followed Ashmead (1904 a) and Girault (1913 a) in dividing it into two subfamilies: Trichogramminae and Oligositinae. He recorded two genera in Oligositinae and three genera in Trichogramminae. He (1972) followed the recent workers in using the family name as Trichogrammatidae.

Nikol'skaya (1952) followed Girault (1912) in using the family name as Trichogrammatidae. She described 20 genera and 55 species of Trichogrammatidae from U.S.S.R. She discarded Ashmead's (1904 a) and Girault's (1912) systems of classifying Trichogrammatids into subfamilies and tribes respectively.

Peck et al. (1964) divided the family Trichogrammatidae into two subfamilies, Trichogrammatinae and Lathromerinae, the latter was recognized as a tribe by Girault (1912). Their classification is principally based on the presence or absence of funicle. They provided a key to 26 genera of Trichogrammatidae from Czechoslovakian region.

Doutt and Viggiani's (1968) "The classification of the Trichogrammatidae (Hymenoptera:Chalcidoidea)" is an excellent consolidated work containing a key to known genera of the family

Trichogrammatidae, check list of generic names, comments and check list of species under each genus of 63 recognized genera of the family Trichogrammatidae. In this work they uphold Nikol'skaya (1952) in discarding Ashmead's (1904 a) and Girault's (1912) systems of classifying Trichogrammatids into subfamilies and tribes respectively.

Very little work has been done on the Indian Trichogrammatidae. Some important contributions were made by Mani (1938, 1939), Subba Rao (1969 a & b), Nagaraja and Nagarkatti (1969), Nagarkatti (1972), Nagaraja (1973), Viggiani and Hayat (1974), Khan (1975 a & b, 1976) and Khan and Shafee (1977).

The present writer accepted the recent workers in using the family name as Trichogrammatidae. Key to Indian genera of the family Trichogrammatidae is given. Some additional generic characters are suggested for the genera Brachygrammatella Girault and Mirufens Girault.

The present work contains the study of 2 genera and 6 species of Trichogrammatidae. The species were recently published as new by the present writer (Khan, 1975 a & b, 1976 and Khan & Shafee, 1977).

KEY TO INDIAN GENERA OF TRICHOGRAMMATIDAE

1. Disc of fore wings densely setose; stigmal vein slightly developed. 2

__ Disc of fore wings naked or sparsely setose or setae arranged in one or several rows. 3

2. Funicle absent; club long. . . . . .Aphelinoidea Girault

__ Funicle present, 2-segmented; pronotum formed of two separate pieces and with a membranous area in middle, anterior margin V-shaped, posterior margin concave (Pl. 40, fig. C); first valvifers triangular with basal and apical angles at different levels (Pl. 40, fig. H; Pl. 41, fig. H); outer plates of ovipositor with submarginal inflection along dorsal margin, longer than second valvifers (Pl. 40, fig. J; Pl. 41, fig. J); posterior margin of subgenital plate with a wide notch in middle, notch followed by laterally directed ridges (Pl. 40, fig. K; Pl. 41, fig. K); male genitalia without digitus (Pl. 40, fig. M; Pl. 41, fig. M; Viggiani & Hayat, 1974, Pl. 4, fig. 3). . . . . .Brachygrammatella Girault

3. Body normal, not dorso-ventrally flattened; fore wings usually broad, less than five times as long as wide, apical margin broadly rounded; marginal fringe less than one-half the wing length. 4

__ Body dorso-ventrally flattened; fore wings very narrow,

about eight times as long as wide, apical margin narrowly rounded; marginal fringe very long, more than one-half the wing length; disc of fore wings with single sparse row of long setae extending distally from stigmal vein; antennae with 1-segmented funicle and 2-segmented club. . . . . Megaphragma Timberlake

4. Funicle present; disc of fore wings sparsely setose or setae arranged in several rows. 5

__ Funicle absent; disc of fore wings nearly devoid of setae; marginal vein longer than submarginal vein; club 3-segmented; inner surface of hind tibiae with row of setae. . . . . Paruscanoidea Girault

5. Female club 1-segmented. 6

__ Female club 3-segmented. 7

6. Stigmal vein short; fore wings with vein track RS 1 present; male antennae with 1-segmented club. . . . . .Trichogramma Westwood

__ Stigmal vein long and narrow; fore wings with vein track RS 1 absent; male antennae with 3-segmented club. . . . . ..Trichogrammatoidea Girault

7. Disc of fore wings with setae not arranged in rows; marginal fringe long; funicle 1-segmented. 8

__ Disc of fore wings with setae arranged in several rows; marginal fringe usually short; funicle 2-segmented. . .9

8. Dorsum of head and thorax with long setae; middle and hind tibiae spiny; claws long; scape atleast as long as funicle and club together; marginal fringe longer than wing width. . . . . .Prestwichia Lubbock

__ Dorsum of head and thorax with short setae; middle and hind tibiae without spines; claws short; scape atmost as long as club; marginal fringe often shorter than wing width. . . . . .Oligosita Walker

9. Marginal vein straight and touching the wing margin. .10

__ Marginal vein curved, not touching the wing margin. . 11

10. Ovipositor long and exserted; marginal vein long and straight; stigmal vein usually constricted, shorter than marginal vein. . . . . .Chaetostricha Walker

__ Ovipositor not exserted; marginal vein short; stigmal vein as long as marginal vein. . . . . Ufens Girault

11. Premarginal and marginal veins contiguous, not separated by hyaline break; male antennae similar to female without whorl of long bristles (Doutt & Viggiani, 1968, fig. 23 B). . . . . .Poropoea Foerster

__ Premarginal and marginal veins distinctly separated by a hyaline break; male antennae with whorl of long bristles on funicle and club segments (Pl. 42, fig. N; Pl. 44, fig. L); pronotum formed of two separate pieces and with membranous area in middle, anterior margin V-shaped, posterior margin straight (Pl. 42, fig. C; Pl. 44, fig.

C); first valvifers semicircular with basal and apical angles in one plane (Pl. 42, fig. J; Pl. 44, fig. H); second valvifers long and narrow, third valvulae movably articulated with second valvifers (Pl. 42, fig. K; Pl. 44, fig. I); outer plates of ovipositor, shorter than second valvifers (Pl. 42, fig. M; Pl. 44, fig. J).. . . . . Mirufens Girault

1. Genus Brachygrammatella Girault

Brachygrammatella Girault, 1915, Mem. Queensl. Mus., 3: 147. Type-species: Brachygrammatella nebulosa Girault.

The genus Brachygrammatella was proposed by Girault (1915) for the species Brachygrammatella nebulosa Girault. Doutt and Viggiani (1968) synonymized the genus Pseudbrachygramma Girault with Brachygrammatella Girault. However, they recognized Pseudbrachygramma as subgenus of Brachygrammatella. The distinguishing characters of this genus have been given in detail by Doutt (1968). The present writer suggested some new generic characters which are as follows: Pronotum formed of two separate triangular pieces and with a membranous area in middle, anterior margin V-shaped, posterior margin concave (Pl. 40, fig. C); first valvifers triangular with basal and apical angles at different levels (Pl. 40,

fig. H; Pl. 41, fig. H); anterior margin of basal part of second valvifers curved, semicircular, third valvulae absent (Pl. 40, fig. I; Pl. 41, fig. I); outer plates of ovipositor narrow at base, gradually broadened apically, with submarginal inflection along dorsal margin, much longer than second valvifers (Pl. 40, fig. J; Pl. 41, fig. J); subgenital plate small, posterior margin with a wide notch in middle, sides of notch followed by laterally directed ridges (Pl. 40, fig. K; Pl. 41, fig. K); male genitalia with gonobase longer than aedeagus, digitus absent (Pl. 40, fig. M; Pl. 41, fig. M; Viggiani and Hayat, 1974, Pl. 4, fig. 3).

Doutt's (1968) key to subgenera and species of the genus Brachygrammatella Girault has been revised in order to accommodate three Indian species (B. indica Viggiani & Hayat, B. longiclavata Khan and B. aligarhensis Khan).

Revised key to subgenera and species of the genus Brachygrammatella Girault, based on females

1. Fore wings with setae immediately beneath marginal vein; middle tibiae without large spines on outer surface; hind wings with abundant setae; club 2-segmented in both sexes. . .(subgenus Brachygrammatella). 2

__ Fore wings with bare area immediately beneath marginal vein; middle tibiae with large spine or spines on outer

surface; hind wings with setae in two or more distinct lines converging apically; female club of 1-segmented. . . . . .(subgenus Pseudbrachygramma). 3

2. Marginal vein four times as long as wide; setae on marginal vein rather fine and numerous (about 20), continuing on to wing blade in a triangular cluster beneath marginal vein. . . . . B. nebulosa Girault

__ Marginal vein about three times as long as wide; about eight large, coarse setae on marginal vein, approximately the same number underneath stigmal and apex of marginal vein. . . . . .B. salutaris Doutt

3. Ovipositor not extended forward beneath thorax. 4

__ Ovipositor extended anteriorly in membranous pouch beneath thorax and forward of midcoxal bases (Doutt, 1968, fig. C). . . . . .B. ventralis Doutt

4. Fore wings with marginal fringe. 5

__ Fore wings without marginal fringe (Viggiani & Hayat, 1974, Pl. 4, fig. 1); submarginal vein without break in middle; marginal vein more than twice as long as wide and with 21 small setae. . . .B. indica Viggiani & Hayat

5. Fore wings dusky with contrasting transverse hyaline band across wing blade just distad of venation. 6

__ Fore wings not so patterned. 7

6. Cubital hair line present; marginal vein three times as long as wide bearing 3 long and 11 small setae (Doutt,

1968, fig. G); disc of hind wings with 4 rows of setae . . . . . B. speciosissima (Girault)

__ Cubital hair line absent; marginal vein slightly more than twice as long as wide bearing 27 small setae (Pl. 41, fig. D); disc of hind wings with more than 4 rows of setae. . . . . B. longiclavata Khan

7. Scape slightly flattened, two and a half times as long as wide; club less than twice as long as wide (Doutt & Viggiani, 1968, fig. 24 E); submarginal vein without an abrupt break in middle; cubital hair line present; marginal vein with 4 long and 14 small setae; stigmal vein well developed; setae on outer border of marginal vein longer than stigmal vein. . . B. perplexa (Girault)

__ Scape cylindrical, slightly less than four times as long as wide; club slightly more than twice as long as wide; submarginal vein with an abrupt break in middle; cubital hair line absent; marginal vein with 20 small setae; stigmal vein short; setae on outer border of marginal vein shorter than stigmal vein. . . . . B. aligarhensis Khan

Brachygrammatella aligarhensis Khan

(Plate 40, figs. A-M)

Brachygrammatella indica Khan, 1975, Curr. Sci., 44: 430 (Pre-occupied by Brachygrammatella indica Viggiant & Hayat,

1974, Boll. Lab. Ent. Agr. Portici, 31: 150).

Brachygrammatella aligarhensis Khan, 1976, Curr. Sci., 45: 392 (New name for B. indica Khan).

The present writer suggested some additional specific characters which are as follows: Female. Mandibles with acute teeth (fig. A); pronotum formed of two separate triangular pieces and with a membranous area in middle, posterior margin slightly concave, antero-lateral angles acute (fig. C); scutum and scutellum with one and two pairs of setae respectively; parapside and axilla each with single seta; mesopostphragma well developed (fig. D); first valvifers triangular with basal and apical angles at different levels, outer margin shorter than basal and inner margins separately (fig. H); anterior margin of basal part of second valvifers curved, semicircular; third valvulae absent (fig. I); outer plates of ovipositor long, narrow at base, broadened apically with submarginal inflection along dorsal margin, longer than second valvifers (fig. J); subgenital plate small, posterior margin with a wide notch in middle, notch followed by laterally directed ridges (fig. K). Male. Antennae 5-segmented; scape slightly less than three times as long as wide; pedicel slightly longer than wide, about one-half the length of scape; funicle 2-segmented; club entire, one and a half times as long as wide (fig. L); male genitalia with gonobase shorter than aedeagus, digitus absent (fig. M).

PLATE 40

Figs. A-M. Brachygrammatella aligarhensis Khan

A. Mandible, ♀

B. Antenna, ♀

C. Pronotum, ♀

D. Propodeum and part of thorax in dorsal view, ♀

E. Fore wing, ♀

F. Part of middle leg, ♀

G. Part of hind leg, ♀

H. First valvifer, ♀

I. Second valvifer, ♀

J. Outer plate of ovipositor, ♀

K. Subgenital plate, ♀

L. Antenna, ♂

M. Genitalia, ♂

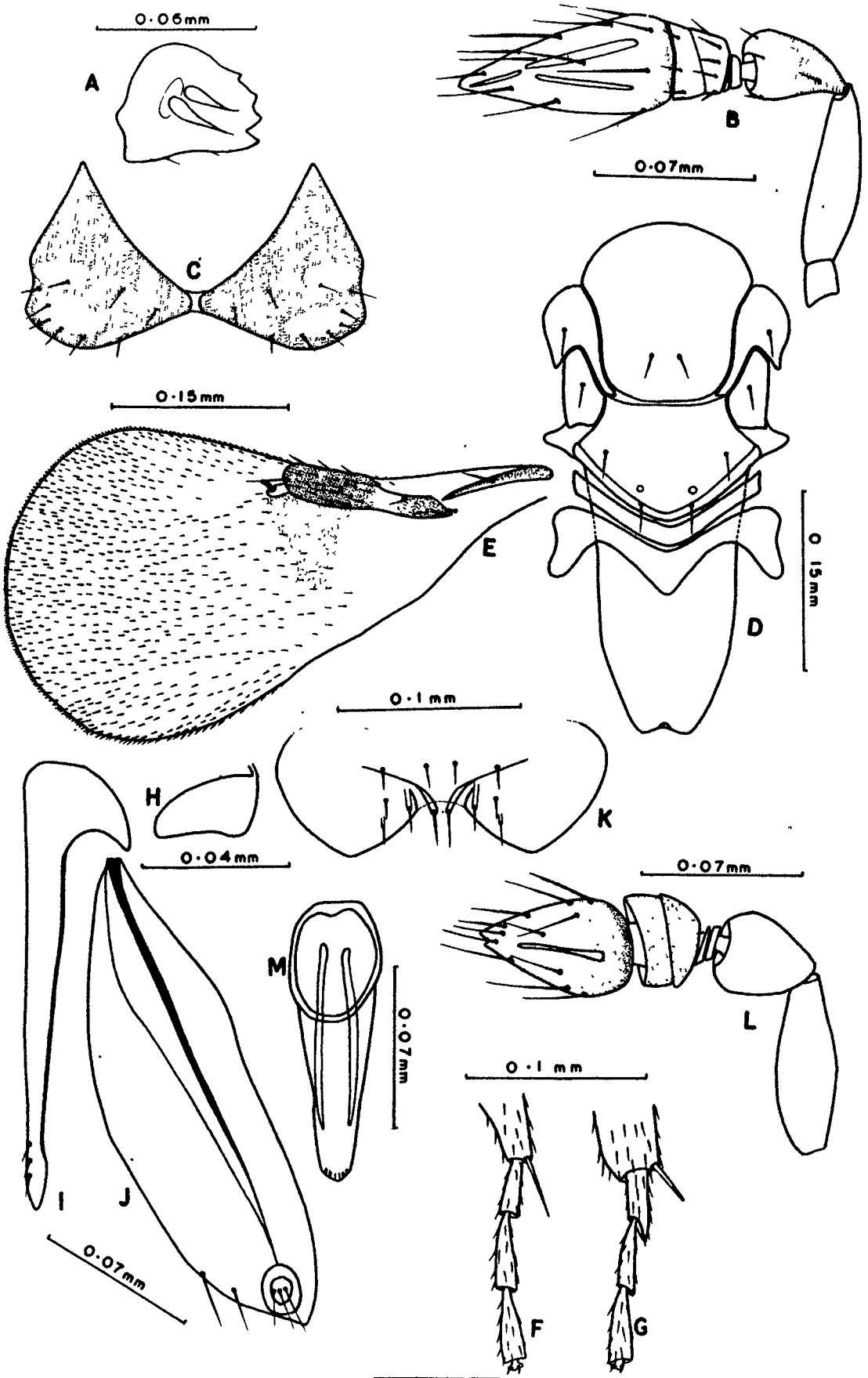
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PLATE 40

Material examined.- 3 ♀, 2 ♂, INDIA: Uttar Pradesh, Aligarh, University Campus, ex eggs of Oxyrachis tarandus Fabr. on Cassia fistula, 18.ix.1974 (M. Younus Khan).

Brachygrammatella longiclavata Khan

(Plate 41, figs. A-M)

Brachygrammatella longiclavata Khan, 1975, Curr. Sci., 44: 635.

The present writer suggested some additional specific characters which are as follows: Female. Mandibles with acute teeth (fig. A); Scutum and scutellum each with two pairs of setae (fig. C); parapside and axilla each with single seta (fig. C); first valvifers triangular with basal and apical angles at different levels, outer margin shorter than basal and inner margins separately (fig. H); anterior margin of basal part of second valvifers curved, semicircular; third valvulae absent (fig. I); outer plates of ovipositor long, narrow at base with submarginal inflection along dorsal margin, longer than second valvifers (fig. J); subgenital plate small, posterior margin with a wide notch in middle, notch followed by laterally directed ridges (fig. K). Male. Antennae 5-segmented; scape three and a half times as long as wide; pedicel slightly longer than wide, more than one-half the length of scape; funicle 2-segmented; funicle segments first and second each more than two and a half times as wide as long; club entire, one and a

PLATE 41

Figs. A-M. Brachygrammatella longiclavata Khan

A. Mandible, ♀

B. Antenna, ♀

C. Propodeum and part of thorax in dorsal view, ♀

D. Fore wing, ♀

E. Hind wing, ♀

F. Part of middle leg, ♀

G. Part of hind leg, ♀

H. First valvifer, ♀

I. Second valvifer, ♀

J. Outer plate of ovipositor, ♀

K. Subgenital plate, ♀

L. Antenna, ♂

M. Genitalia, ♂

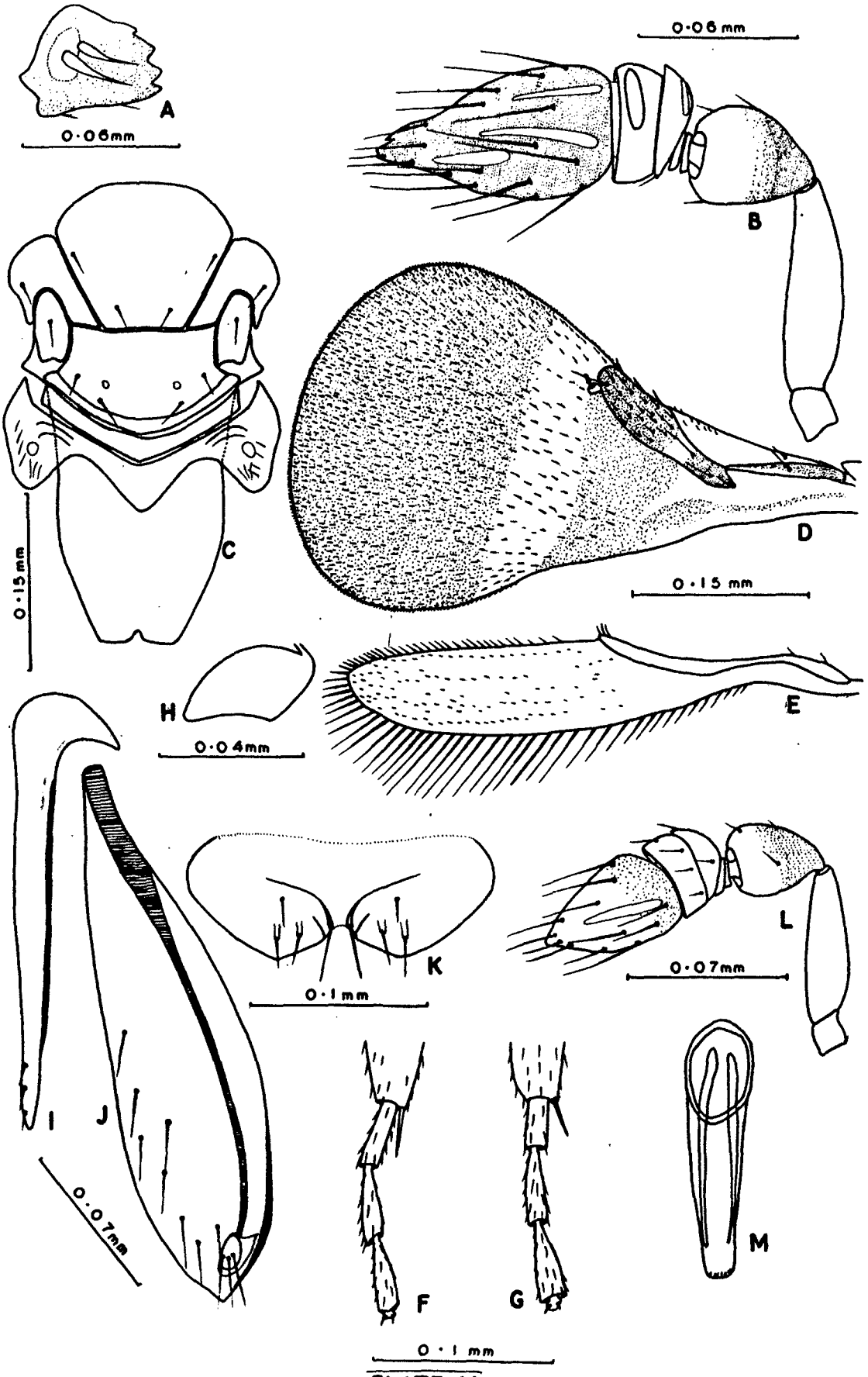
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PLATE 41

half times as long as wide (fig. L); male genitalia with gobobase shorter than aedeagus, digitus absent (fig. M).

Material examined.- 3 ♀, 3 ♂, INDIA: Uttar Pradesh, Aligarh, University Campus, ex eggs of Oxyrachis tarandus Fabr. on Cassia fistula, 18.xi.1974 (M. Younus Khan).

2. Genus Mirufens Girault

Mirufens Girault, 1915, Mem. Queesl. Mus., 3: 147.
Type-species: Mirufens dentipes Girault.

The genus Mirufens was proposed by Girault (1915) for the species Mirufens dentipes Girault. Doutt and Viggiani (1968) declared Trachocera Blood and Kryger as synonym of Mirufens Girault. However, they divided the genus Mirufens into two subgenera, Mirufens and Trachocera on the basis of length of stigmal vein, presence or absence of hyaline break between the premarginal and marginal veins, length of club and contiguous or separated condition of marginal vein with wing margin. The distinguishing characters of this genus have been given in detail by Doutt and Viggiani (1968). Recently, Khan and Shafee (1977) proposed some new generic characters of pronotum and external female genitalia. The present writer suggested some additional generic characters which are as follows: Notch of posterior margin of subgenital

plate followed by anteriorly or laterally directed ridges (Pl. 42, fig. L; Pl. 44, fig. K); Male genitalia with gonobase longer than aedeagus, digitus with one or two projections (Pl. 42, fig. O; Pl. 44, fig. M; Viggiani and Hayat, 1974, Pl. 1, fig. 4; Pl. 3, fig. 4). Khan and Shafee's (1977) key to Indian species of the genus Mirufens Girault has been revised in order to incorporate some additional specific characters examined by the present writer. Key to some Indian species of Mirufens Girault based on males is also provided.

Revised key to Indian species of Mirufens Girault, based on females

1. Ovipositor arising from base of abdomen. 2

__ Ovipositor not arising from base of abdomen. 5

2. First funicle segment as long as wide or wider than long 3

__ First funicle segment cylindrical, distinctly longer than wide (Viggiani & Hayat, 1974, Pl. 2, fig. 1); scape cylindrical, three and a half times as long as wide, twice the length of pedicel; second funicle segment cup-shaped, a little shorter than first; club long, slightly more than five times as long as wide; fore wings slightly less than twice as long as wide, apex broadly rounded. . . M. longifuniculata Viggiani & Hayat

3. Club 3-4 times as long as wide; first and second funicle segments wider than long. 4

__ Club six times as long as wide; first funicle segment as long as wide, slightly longer than second, second slightly wider than long; fore wings twice as long as wide; marginal vein as long as stigmal vein; reticulate sculpture of scutum and scutellum with longitudinal striations (Pl. 44, figs. E & F); sensoria of scutellum surrounded by 4 cells (Pl. 44, fig. F); mesopostphragma measured from apex of scutellum as long as scutum, apical margin broadly truncated (Pl. 44, fig. D); subgenital plate almost circular, posterior margin with a notch in middle, notch followed by anteriorly directed ridges, mid-longitudinal groove distinct (Pl. 44, fig. K); third valvulae slightly more than one-fifth the length of second valvifers (Pl. 44, fig. I). . . . . .M. longiclavata Khan & Shafee

4. Scutellum yellow; first funicle segment shorter than second; club less than three times as long as wide; marginal vein as long as stigmal vein; reticulate sculpture of scutum and scutellum with transverse striations (Pl. 43, figs. C & D); sensoria of scutellum surrounded by 7 hexagonal cells (Pl. 43, fig. D); mesopostphragma measured from apex of scutellum about as long as scutum. . . . .M. albiscutellum Khan & Shafee

__ Scutellum dark brown; first funicle segment longer than second; club four times as long as wide; marginal vein shorter than stigmal vein. M. mangiferae Viggiani & Hayat

5. Body largely honey yellow; first funicle segment shorter than second. 6

__ Body dark brown with frontovertex, mid-longitudinal area of scutum and scutellum yellow; first funicle segment longer than second; malar space longer than eye width; scape cylindrical, four times as long as wide; pedicel about one and a half times as long as wide, slightly more than one-half the length of scape; ring segments indistinct; club three and a half times as long as wide; apex of stigmal vein with its basal part conical; postmarginal vein absent; reticulate sculpture of scutum and scutellum with transverse striations (Pl. 42, figs. E & F); sensoria of scutellum surrounded by three cells (Pl. 42, fig. F), mesopostphragma measured from apex of scutellum shorter than scutum, apical margin with a notch in middle (Pl. 42, fig. D); third valvulae slightly more than one-fifth the length of second valvifers; subgenital plate with posterior margin semicircular with a notch in middle, notch followed by laterally directed ridges (Pl. 42, fig. L). . . . . M. brevifuniculata Khan & Shafee

6. Fore wings without marginal fringe; scape three and a half times as long as wide, as long as pedicel and funicle together; antennae with two indistinct ring segments; club four times as long as wide; fore wings a little more than twice as long as wide. . . . . M. afrangiata Viggiani & Hayat

__ Fore wings with short marginal fringe; scape four and a half times as long as wide, much longer than pedicel and funicle together; antennae with one ring segment; club three times as long as wide; fore wings less than twice as long as wide. . . M. magniclavata Khan & Shafee

Key to some Indian species of Mirufens Girault, based on males

1. Club less than six times as long as wide; genitalia not much broad, more than three times as long as wide, anterior margin of basal part of gonobase narrow, digitus short, each with two small projections. 2

__ Club six times as long as wide; genitalia much broad, two and a half times as long as wide, anterior margin of basal part of gonobase broadly rounded, digitus well developed, each with a single long projection (Pl. 44, fig. M); scape four times as long as wide; pedicel as long as first funicle segment; funicle segments longer than wide. . . . . M. longiclavata Khan & Shafee

2. Pedicel longer than first funicle segment; funicle segments quadrate or wider than long. 3

__ Pedicel as long as first funicle segment; funicle segments longer than wide; club five times as long as wide (Viggiani & Hayat, 1974, Pl. 3, fig. 3); genitalia three and a half times as long as wide (Viggiani & Hayat, 1974, Pl. 3, fig. 4). . . . . M. mangiferae Viggiani & Hayat

3. Funicle segments wider than long; club slightly less than three times as long as wide (Pl. 42, fig. N); genitalia four times as long as wide (Pl. 42, fig. O). . . . . M. brevifuniculata Khan & Shafee

__ Funicle segments quadrate; club more than four times as long as wide (Viggiani & Hayat, 1974, PL. 1, fig. 3); genitalia broad, three and a half times as long as wide (Viggiani & Hayat, 1974, Pl. 1, fig. 4). . . . . M. afrangiata Viggiani & Hayat

Mirufens brevifuniculata Khan and Shafee

(Plate 42, figs. A-O)

Mirufens brevifuniculata Khan & Shafee, 1977, Entomophaga, 22:31.

The present writer examined some additional specific characters which are as follows: Female. Mandibles with acute teeth (fig. A); postero-lateral ridges of pronotum each with

PLATE 42

Figs. A-O. *Mirufens brevifuniculata* Khan & Shafee

A. Mandible, ♀

B. Antenna, ♀

C. Pronotum, ♀

D. Propodeum and part of thorax in dorsal view, ♀

E. Sculpture of scutum, ♀

F. Sculpture of scutellum, ♀

G. Fore wing, ♀

H. Part of middle leg, ♀

I. Part of hind leg, ♀

J. First valvifer, ♀

K. Second valvifer and third valvula, ♀

L. Subgenital plate, ♀

M. Outer plate of ovipositor, ♀

N. Antenna, ♂

O. Genitalia, ♂

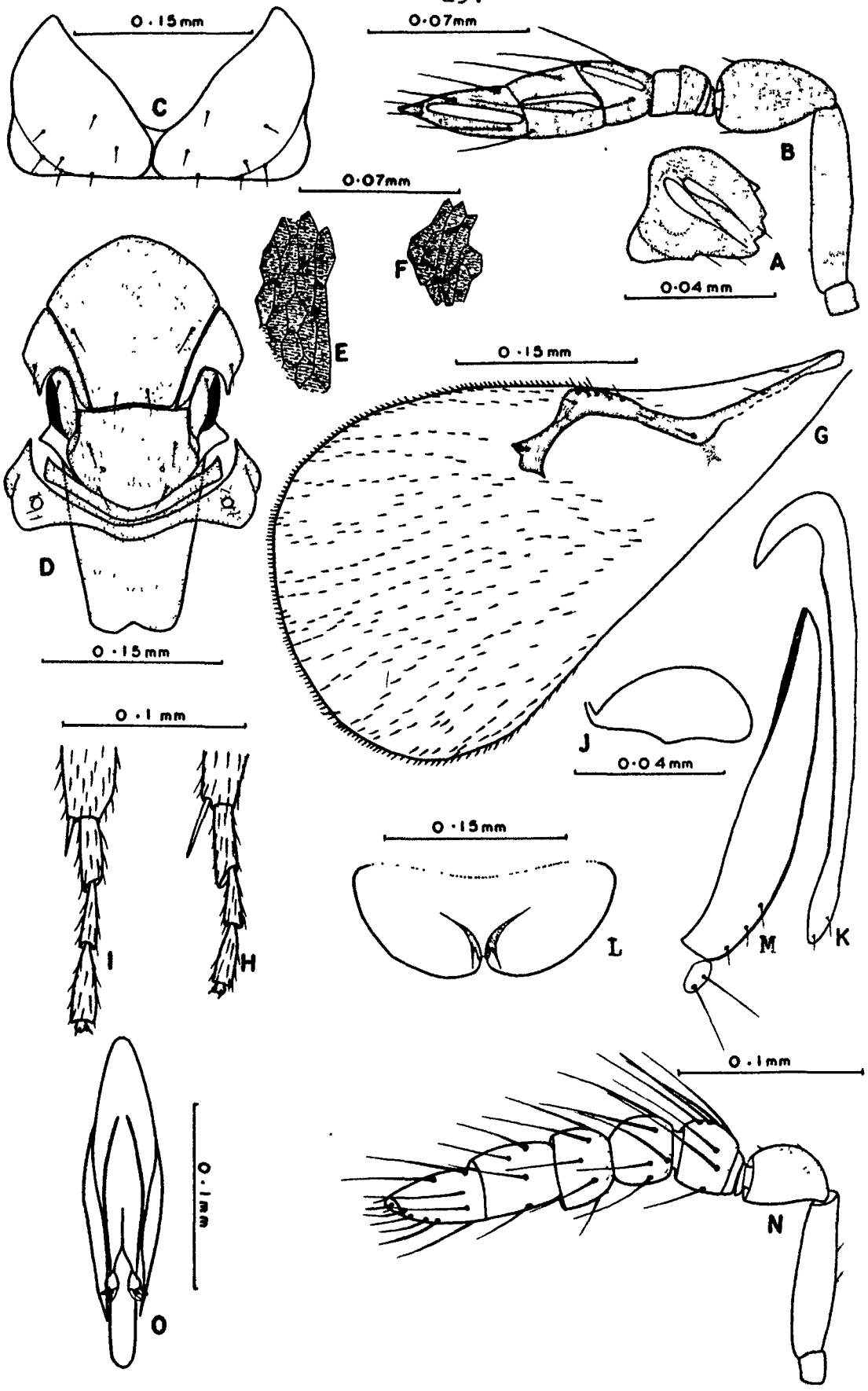
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PLATE 42

3 small setae (fig. C); scutum and scutellum reticulately sculptured and each with 2 pairs of setae (fig. D); reticulate sculpture of scutum and scutellum with transverse striations (figs. E & F); scutellar sensoria surrounded by three long cells (fig. F); mesopostphragma measured from apex of scutellum shorter than scutum, apical margin with a notch in middle (fig. D); subgenital plate small, posterior margin semicircular with small notch in middle, notch followed by laterally directed ridges (fig. L). Male. Antennal scape cylindrical, four times as long as wide; pedicel longer than first funicle segment; funicle 2-segmented, segments subequal, each slightly wider than long; club 4-segmented, slightly more than three times as long as wide, apical segment small; male genitalia four times as long as wide, anterior margin of basal part of gonobase narrow, digitus small, bearing two small projections (fig. O).

Material examined.- 9 ♀, 3 ♂, INDIA: Uttar Pradesh, Aligarh, University Campus, ex eggs of Oxyrachis tarandus Fabr. on Acacia sp., 10.x.1975 (M. Younus Khan).

Mirufens albiscutellum Khan and Shafee

(Plate 43, figs. A-E)

Mirufens albiscutellum Khan & Shafee, 1977, Entomophaga, 22:32.

The present writer examined some additional specific

characters which are as follows: Scutum and scutellum reticulately sculptured and each with 2 pairs of setae (fig. B), sculpture of scutum and scutellum with transverse striations (figs. C & D); sensoria of scutellum surrounded by 7 hexagonal cells (fig. D); mesopostphragma measured from apex of scutellum about as long as scutum (fig. B).

Material examined.- 3 ♀, INDIA: Uttar Pradesh, Aligarh, University Campus, ex eggs of Oxyrachis tarandus Fabr. on Acacia sp., 10.x.1975 (M. Younus Khan).

Mirufens magniclavata Khan and Shafee

(Plate 43, figs. F-G)

Mirufens magniclavata Khan & Shafee, 1977, Entomophaga, 22:32.

Material examined.- 2 ♀, INDIA: Uttar Pradesh, Aligarh, University Campus, ex eggs of Oxyrachis tarandus Fabr. on Acacia sp., 10.x.1975 (M. Younus Khan).

Mirufens longiclavata Khan and Shafee

(Plate 44, figs. A-M)

Mirufens longiclavata Khan & Shafee, 1977, Entomophaga, 22:34.

The present writer examined some additional specific characters which are as follows: Female. Mandibles with acute

PLATE 43

Figs. A-E. Mirufens albiscutellum Khan & Shafee

A. Antenna, ♀

B. Propodeum and part of the thorax in dorsal view, ♀

C. Sculpture of scutum, ♀

D. Sensoria of scutellum, ♀

E. Fore wing, ♀

Figs. F-G. Mirufens magniclavata Khan & Shafee

F. Antenna, ♀

G. Fore wing, ♀

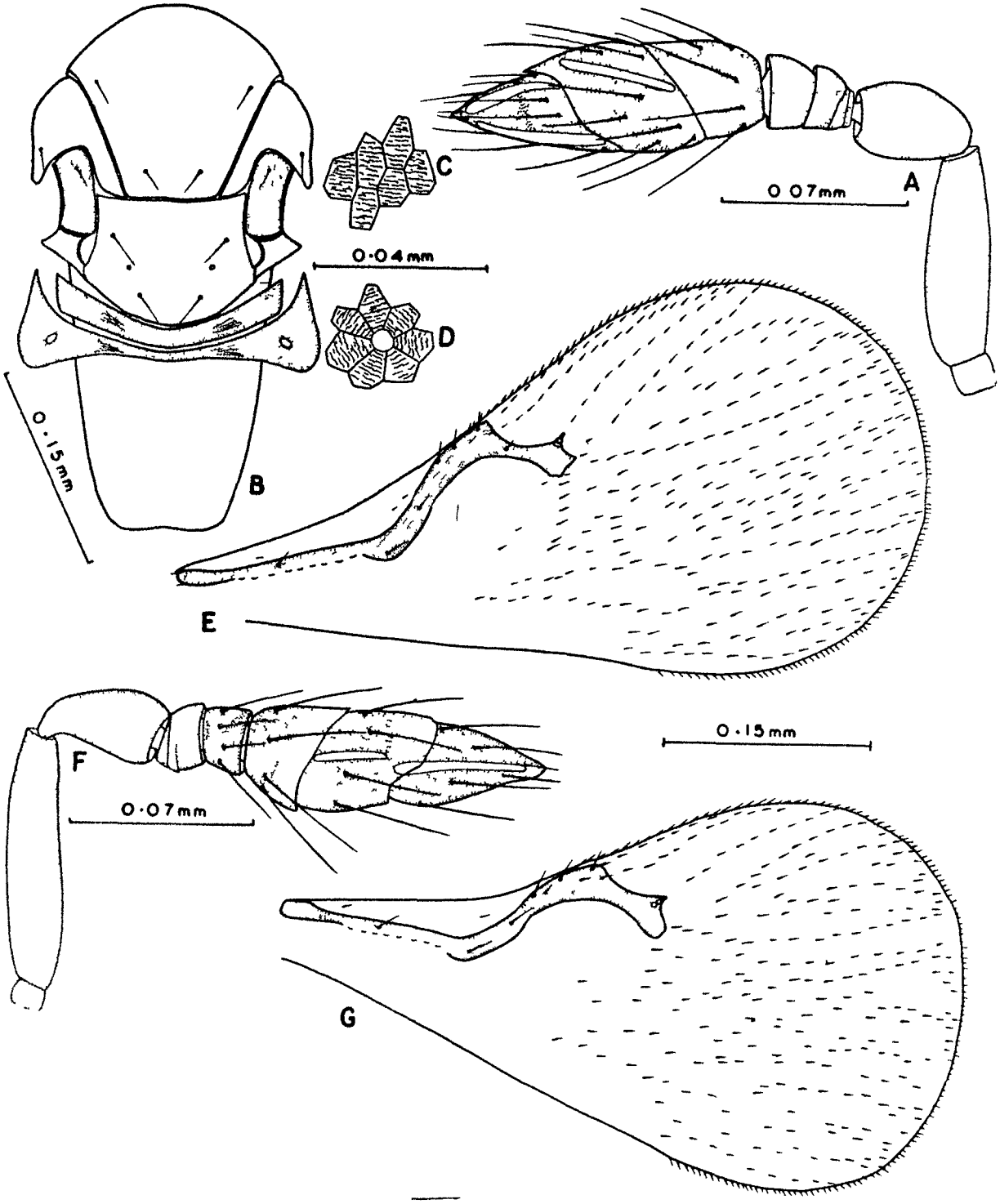

PLATE 43

teeth (fig. A); pronotum formed of two separate triangular pieces, anterior margin V-shaped, posterior margin straight with submarginal ridge bearing 4 pairs of setae (fig. C); Scutum and scutellum reticulately sculptured and each with 2 pairs of setae, sculpture with longitudinal striations (figs. E & F); scutellar sensoria surrounded by 4 cells (fig. [illegible]); mesopostphragma measured from apex of scutellum as long as scutum, apical margin broadly truncated (fig. D); subgenital plate almost circular, posterior margin with a small notch in middle, notch followed by anteriorly directed ridges, mid-longitudinal groove distinct (fig. K). Male. Antennal scape slightly more than four times as long as wide; pedicel as long as first funicle segment; funicle 2-segmented, segments subequal, each distinctly longer than wide; club 4-segmented, six times as long as wide, apical segment small (fig. L); male genitalia broad, two and a half times as long as wide, anterior margin of basal part of gonobase broadly rounded, digitus well developed each with single long projection (fig. M).

Material examined.- 4 ♀, 3 ♂, INDIA: Uttar Pradesh, Aligarh, University Campus, ex eggs of Oxyrachis tarandus Fabr. on Acacia sp., 10.x.1975 (M. Younus Khan).

PLATE 44

Figs. A-M. *Mirufens longiclavata* Khan & Shafee

A. Mandible, ♀

B. Antenna, ♀

C. Pronotum, ♀

D. Propodeum and part of thorax in dorsal view, ♀

E. Sculpture of scutum, ♀

F. Sculpture of scutellum, ♀

G. Fore wing, ♀

H. First valvifer, ♀

I. Second valvifer and third valvula, ♀

J. Outer plate of ovipositor, ♀

K. Subgenital plate, ♀

L. Antenna ♂

M. Genitalia, ♂

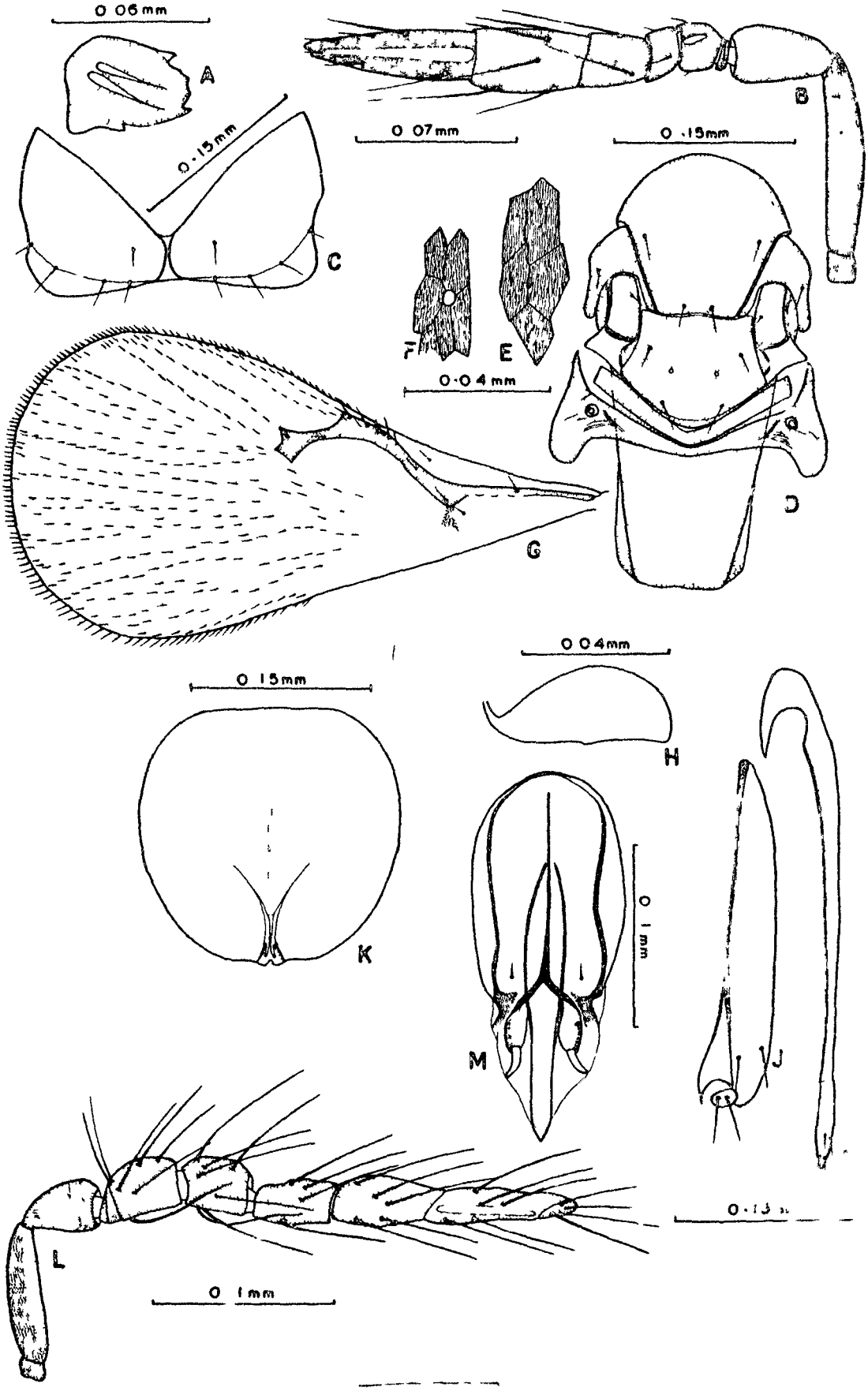
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PLATE 44

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